

# A Guide to the Land Snails and Slugs of Montana

Prepared for:

U. S. Forest Service - Region 1

Prepared by:

Paul Hendricks

**Montana Natural Heritage Program**

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## EXECUTIVE SUMMARY

This guide provides the first comprehensive summary of the land mollusk fauna (slugs and snails) for Montana. It includes a checklist of species, separate keys for slugs and snails, and individual species accounts. Species accounts include a distribution map, a photograph when available, and text on physical appearance, distribution, habitat, conservation status, remarks, and selected references. A glossary of terms used in the keys and species accounts appears after the species accounts, along with a list of references cited in the body, and three appendices; the first appendix is a guide to Conservation Status, the second a table of habitat associations for all Montana species, and the third a copy of a field survey form. Following the brief Introduction are sections discussing the composition of the Montana mollusk fauna with a comparison to adjacent regions, a brief overview of the ecological significance of land mollusks, and remarks on how to study mollusks with suggestions for conducting surveys.

The extant Montana fauna includes 16 species of slugs and 62 species of land snails. Of these, 7 slugs and 3 snails are introduced species (exotics), leaving 68 species (9 slugs and 59 snails) native to Montana. Eight native slugs and 15 native land snails are Montana Species of Concern (SOC); 5 SOC snails are endemic (globally restricted) to Montana.

Species richness of Montana land mollusks is higher west of the Continental Divide. Eight native slugs (all of the SOC slugs) are found only west of the Divide, the ninth native slug occurring statewide. Of the native snails, 20 occur only west of the Divide, 17 only east of the Divide, and 22 on both sides of the Divide. The documented native mollusk fauna thus includes 42 species west of the Continental Divide and 39 species east of the Divide. Of the 15 SOC snails; 8 are present only west of the Divide, 4 only east of the Divide, and 3 on both sides of the Divide.

## ACKNOWLEDGEMENTS

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Important material from Montana is housed in several museum collections. Thanks to Robert Van Syoc (California Academy of Sciences), Rob Guralnick, Mariko Kageyama and Kat Weaver (University of Colorado Museum of Natural History), Leslie Skibinski (Delaware Museum of Natural History), Jochen Gerber (Field Museum of Natural History), and Paul Greenhall and Tyjuana Nickens (Smithsonian Institution) for their help in answering questions or providing electronic spreadsheets of holdings in their respective institutions. Thanks also to the Carnegie Museum of Natural History and the Academy of Natural Sciences of Philadelphia for making their collections accessible on the Internet.

In the early stages of this work the late Royal Bruce Brunson functioned as an important catalyst by sharing his knowledge of the Montana fauna and offering me access to his personal collections. Lee Fairbanks (Pennsylvania State University)

provided important details for a number of significant *Oreohelix* locations, Terry Frest (Deixis Consultants) verified some early determinations by a neophyte malacologist, Bill Leonard (Olympia, Washington) freely shared his enormous experience with the land mollusk fauna of the Pacific Northwest on many occasions and offered guidance in making tough determinations, Tom Burke (retired from the U.S. Forest Service) shared early drafts of keys and species accounts for a guide to the land mollusks of the Pacific Northwest that he and Bill have been working on, which helped in the development of similar material for Montana. Bryce Maxell provided guidance, encouragement and flexibility within the workings of the Montana Natural Heritage Program to see this work reach fruition.

More eyes in the field flipping rocks and rolling logs added many new records. Steve Schlang volunteered his time and enthusiasm, and made many surveys much more productive than they might otherwise have been; remote locations were a treat to explore when he was along. He, and Heritage colleagues Bryce Maxell, Susan Lenard and Coburn Currier, made sure that survey coverage was more thorough than what one person could have accomplished. Coburn also entered survey results into the Heritage databases, produced the species account maps, formatted several reports (including this one), asked intelligent questions, and made sure the final product was better than it would have been without his attention to detail. This report was proof-read by Bryce Maxell, Coburn Currier, and Heritage Program Director, Neil Snow.

Much remains to be learned about the land mollusks of Montana. However, our knowledge of this obscure but important part of Montana's natural heritage is now much greater because of the persons and organizations previously mentioned. This is publication no. 2012-001 of the Montana Natural Heritage Program.

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Appendix A: Global / State Rank Definitions

Appendix B: Montana Land Mollusks and their Habitat Associations

Appendix C: Mollusk Survey Field Form



# INTRODUCTION

Montana is more than a state of majestic scenery, trout streams, large and charismatic animals, and a rich diversity of birds. At ground level lies another universe filled with small inhabitants remaining hidden and unnoticed until their world is revealed by turning over a rock or log to see what lies underneath. Among these smaller creatures are land mollusks, the slugs and snails.

Many Montanans are only aware of mollusks when they appear in urban lawns and gardens, and the reaction by humans to their smaller and uninvited neighbors is generally unfavorable. This is unfortunate in light of Montana's rich variety of native slugs and land snails, which are usually absent from urban settings, and rarely noticed in the wild.

The primary reason for developing this guide is to provide a resource whereby the curious can become familiar with land mollusks, a remarkable but underappreciated group of animals that play important roles in native ecosystems. Another reason for developing this guide is to elevate awareness of the conservation significance of Montana's land mollusk fauna and the threats they face, particularly to the habitats they occupy. Yet another reason is to stress that mollusks remain poorly known in Montana, and that important advances in our knowledge of their distribution and conservation status can be achieved with open eyes and just a little bit of effort. New state records will almost assuredly be found and there even remains the possibility of discovering an entirely new species.

## ***The Land Mollusk Fauna of Montana***

As of 2011, the known extant Montana fauna includes 16 species of slugs and 62 species of land snails (see the Checklist). Of these, 7 slugs and 3 snails are introduced species (exotics), leaving 68 species (9 slugs, 59 land snails) native to Montana. Eight of the native slugs and 15 of the native land snails are Montana Species of Concern; 5 of the

Species of Concern snails are endemic (globally restricted) to Montana.

Species diversity (richness) of the Montana land mollusk fauna is greater in the region west of the Continental Divide. Eight native slugs, all Species of Concern, are found only west of the Continental Divide, while the other native species is present across the state. Of the native land snails, 20 are found only west or very near the Continental Divide, 17 are found only east of the Divide, and 22 are present on both sides of the Divide. Thus, the documented native land mollusk fauna of Montana includes 51 species west of the Continental Divide and 40 species east of the Divide. Of Montana slugs and snails that are Species of Concern, 16 occur only west of the Divide, 4 only in the east, and 3 others on both sides of the Divide.

The number of native land mollusk species in Montana is influenced by its geographic position in the Pacific Northwest. Besides Montana's large spatial area (about 380,730 square kilometers or 147,000 square miles) and great topographic relief (almost 3,353 meters or 11,000 feet), it also overlaps three biogeographic provinces (Washingtonian, Rocky Mountain, Great Plains), each with species largely restricted to those provinces. The Washingtonian Province (west of the Continental Divide) is particularly rich in endemic genera and species. The number of native land mollusk species in Montana (68) is quite similar to that for Idaho (70 species: Frest and Johannes 2001) and British Columbia (65 species: Forsyth 2004), but much larger than Wyoming (35 species: Beetle 1989). Montana land mollusk diversity reflects the presence of moister habitats in the mountainous western part of the state, especially west of the Continental Divide, which is influenced by moisture-laden weather systems approaching from the Pacific Northwest. This is a climate feature also present in Idaho and British Columbia, and reflected in the diversity of their respective land mollusk faunas, but largely absent from the drier continental

climate of Wyoming. Western Montana had mesic forests formerly dominated at lower elevations by western red cedar, western hemlock, western white pine, and grand fir, and is still dominated over large areas at higher elevations by Douglas-fir, Engelmann spruce, and subalpine fir. Principle habitat associations for all species documented in Montana are given in Appendix B, as well as in the individual accounts.

West of the Continental Divide are several animal and plant species with affinities to coastal populations. They occur in similar mesic forests but their distributions are isolated from the coast by a non-forested arid landscape. Apparently this was a result of climatic changes and glacial advances during the Quaternary that led to a continental-interior mesic forest refugium in northern Idaho and adjacent portions of Washington, British Columbia, and Montana (Shafer et al. 2010). Land mollusks showing this disjunct pattern include the slug genera *Hemphillia* and *Prophysaon* (Leonard et al. 2003, Forsyth 2004, Ovaska et al. 2004, Wilke and Duncan 2004). In many cases, disjunct coastal and interior populations have proven to be genetically different sister taxa, which have since been elevated to full species status in recent years. Additional slug and snail species with the same distribution patterns also await investigation for potential elevation to distinct species. Montana possibilities include *Haplotrema vancouverense*, *Hemphillia camelus*, and *Prophysaon andersoni*. There also exists the possibility of discovering entirely new species. Two undescribed species of slug (representing two new genera) were found in adjacent northern Idaho during the last decade (Leonard et al. 2003, Leonard et al. 2011), one of which (*Kootenaia burkei*) has since been documented in Montana.

Ten exotic or introduced terrestrial mollusks have been documented in Montana. Idaho has 13 exotic species (Frest and Johannes 2001), whereas the much larger and more generally mesic British Columbia has an astounding 26 species (Forsyth 2004). Exotics are likely to be introduced into Montana through agricultural and horticultural products, either as eggs or juveniles in soil, compost, and root masses. Large slugs and snails

probably move only a few tens of meters in a lifetime, and small species probably move much less, thus requiring external assistance to disperse long distances. Additional exotics are likely to be found when surveys are undertaken in the areas most modified by human disturbance, especially in urban areas and intermountain valleys, and around wetlands. Unfortunately, designated wild lands and protected areas are not immune from inadvertent introductions, as shown by the presence of the Brown-banded Arion (*Arion circumscriptus*), Chocolate Arion (*Arion rufus*), Dusky Arion (*Arion subfuscus*), Giant Gardenslug (*Limax maximus*), and Lovely Vallonia (*Vallonia pulchella*) in Glacier National Park (Hendricks 2009). The impact of exotic mollusks on native snails and slugs in Montana has not been studied, nor has there been consideration of their potential influence on the ability of native vegetation to regenerate in disturbed areas (Grimm et al. 2009, Moss and Hermanutz 2010). It now seems prudent to study these impacts.

## ***Ecological Significance of Terrestrial Mollusks***

Terrestrial mollusks are one group of relatively inconspicuous organisms that play an important role in the decomposition of organic matter and cycling of nutrients in ecosystems. They contribute to soil formation by grazing on live and dead fungus, vascular and non-vascular plants, and organic debris (including carrion) accumulated on the ground. They also concentrate minerals, especially calcium, which is necessary for their reproduction and shell formation. Snail abundance in forests is positively related to calcium concentration in litter and duff, thus snail populations may be limited by calcium availability (Skeldon et al. 2007).

The relationship between snail abundance and available calcium has consequences for vertebrates, such as birds. Birds require external sources of calcium for the formation of their egg shells, and snails are one of the rich sources of supplemental calcium for many birds (Graveland 1996, Patten 2007). Thus, environmental disturbances that reduce snail abundance could affect reproductive



success in birds. In Europe and the northeastern United States, elevated soil acidity resulting from acid precipitation has been linked to declines in snail populations, and problems with eggshell formation and nestling growth in some bird species (Graveland and van der Wal 1996, Hames et al. 2002).

Snails also serve as intermediate hosts to parasites of large game mammals, such as the nematodes that infect members of the deer family (Boag and Wishart 1982, Strayer et al. 1986) and Bighorn Sheep (*Ovis canadensis*). Sheep lungworm infection continues to be a common problem across our region (Forrester 1960, Forrester and Senger 1964, Robb and Samuel 1990), and is transmitted to sheep via *Euconulus fulvus*, *Vertigo gouldi*, and *V. modesta*, all of which are small and wide-spread snail species.

Land mollusk populations are sensitive to disturbances that reduce protection from desiccation. Logging practices and fire can lead to population declines, presumably because habitats are altered in such a way that land mollusks no longer have adequate sources of refuge to avoid drying out over shorter and longer durations (Strayer et al. 1986, Beetle 1997, Hylander et al. 2004, Severns 2005). Dispersal potential by most land mollusks is limited, so the intensity and scale of disturbance undoubtedly affects their ability to recolonize a disturbed landscape. We can imagine scenarios where severe fire could greatly reduce snail populations, with the result that bird nest success declines from reduced access to supplemental calcium for eggshell formation and nestling growth, while incidence of bighorn lungworm infection declines due to elimination of the parasite's intermediate hosts. The degree to which the absence or severely reduced numbers of mollusks affects nutrient cycling, soil formation, and the ability of vegetation to recover from disturbance is largely unstudied. Terrestrial ecosystems are complex, with their numerous parts and processes being linked in countless and often minimally understood ways. Land mollusks are an understudied yet important group that lies in the middle of many ecosystem connections.

## ***Suggestions for Where and How to Find Snails and Slugs, and What to Save***

Land snails and slugs live in almost all terrestrial habitats, including forests, grasslands, alpine slopes and tundra, marshes, and open ground. However, because mollusks require moisture to avoid drying up, they are typically found in sites where humidity levels are relatively high. For many species this means living under a forest or secondary canopy, or in other habitats that provide necessary cover and shelter from desiccation. At a given site seek out the most protected microhabitats and look for slugs and snails there, particularly under medium to large rocks, pieces of bark, accumulations of leaves, downed wood, and at the base of forbs and shrubs. Some groups seem particularly tied to specific substrates, such as limestone, where calcium for shell construction is readily obtained (see Appendix B). Useful comments on where land mollusks live can be found in Forsyth (2004) and Grimm et al. (2009), which remain in print and are easily acquired.

Marking methods for the study of movements, life histories, population features, and discussion of modeling distributions and habitat needs, are beyond the scope of this guide. Useful recent comments and examples can be found in Anderson and Schmidt (2007), Anderson et al. (2007), Dunk et al. (2004), Foltan and Konvicka (2008), Gaines et al. (2005), Hendricks et al. 2008, Pearce (2008), Severns (2009), and Weaver et al. (2006).

The simplest quantitative method for sampling terrestrial mollusks is visual searching using hands and a garden rake to turn over rocks and downed wood. This method is most useful when one needs to rapidly generate a species list for a relatively large area, and can also be used for supplementing more quantitative approaches. One drawback is that very small species are more likely to be overlooked, but direct visual searching is still the simplest and least expensive method for finding land mollusks.

Quantitative methods of sampling include timed searches in a sequence of standard-sized plots or along standard-length transects. These are more time consuming, and may miss important microhabitats, but are amenable to statistical analyses. Use of artificial cover (cardboard sheets or Masonite boards) is another way of standardizing survey effort along plots or transects; snails and slugs in the soil and litter presumably seek shelter under these because the artificial cover retains elevated humidity longer. Bulk sampling is another technique of standardizing survey effort, by collecting standard volumes of litter and soil, which can be sorted later through a series of sieves and examined in the laboratory. This method is especially useful for detecting microsnails (defined as 5 mm or less in size), but processing the samples can be highly time-consuming. Useful discussions of the various sampling techniques are found in Anderson (2005), Bishop (1977), Boag (1982, 1985, 1990), Boag and Wishart (1982), Coppolino (2010), Moss and Hermanutz (2010), Skeldon et al. (1986), Strayer et al. (1986), and Ward-Booth and Dussart (2001). Formal surveys should make use of a standardized field survey form and protocol that captures information on time, location, weather, habitat, as well as species richness and abundance, and which can be compared with survey effort and results of future visits to the same site (monitoring). An example of the Mollusk Survey field form used by the Montana Natural Heritage Program is provided in Appendix C.

Several pieces of information are critical for a mollusk collection to be useful scientifically, including: collector(s) name(s), date of collection (day in numbers, date in letters, year in numbers), and precise locality data that includes GPS coordinates (if possible). Including habitat information further increases the value of the collection. This information should be recorded for permanent (voucher) specimens that are deposited in museums and digital photographs to be posted

online. An example of adequate collecting information is as follows:

Montana: Glacier County: under downed woody debris beneath canopy of western redcedar and black cottonwood adjacent to Avalanche Creek broadwalk, Glacier National Park. Elevation 1018 m (3440 ft), 48.67940°N, 113.81650°W, P. Hendricks, 16 Oct 2008.

Voucher specimens are critical. They serve as permanent records of a species having occurred at a particular place in time, and they allow researchers to reexamine them in the future. Empty shells are easily stored in vials or boxes labeled with the basic data listed above. Slugs and snails require more care to store in fluids, and should be preserved extended or relaxed if their internal anatomy is to be examined. To preserve the specimen, drown first in carbonated water and then transfer to a solution of 70% isopropyl alcohol or, preferably, 70% ethanol, which is less likely to harden tissues. Do not use formalin. Specimens intended for DNA analyses should be preserved in 95% ethanol for best results. As with dry specimens, fluid-preserved specimens should be kept in vials labeled with the essential collection data listed above. Helpful discussion of techniques for collection and preservation of land mollusks can be found in Craze and Barr (2002), Forsyth (2004), and Grimm et al. (2009).

The Montana Natural Heritage Program continues to solicit records of slugs and snails for its databases, which are widely consulted and used by other parties for general interest, land-management and conservation purposes. If you have observations to contribute, or desire help with identifications, please contact the Montana Natural Heritage Program Senior Zoologist via the internet (<http://mtnhp.org>) or at P.O. Box 201800, 1515 East Sixth Street, Helena, MT 59620-1800.

# CHECKLIST OF LAND MOLLUSKS OF MONTANA

This checklist includes all species of terrestrial snails and slugs reported from Montana and supported by some kind of published documentation or voucher specimen. In several cases, species are on the checklist based on faith in the original determinations, as they have not been reported or collected in recent decades, nor were historical collections reexamined. The checklist will likely expand as additional surveys are conducted across more regions of the state. Two species present on an earlier unpublished checklist by Royal Bruce Brunson (no date), *Oxyloma sillimani* (Humboldt Ambersnail) and *Oxychilus cellarius* (Cellar Glass-snail), are not included here because their presence could not be verified by vouchers or other sources of information.

The checklist follows the systematic order presented in Forsyth (2004) and his rationale. The sequence of species accounts in the body of the field guide, though, is split into two arbitrary groupings of terrestrial mollusks, slugs and snails. The sequence within these two groups, however, follows the checklist order. This choice was made because slugs and snails are readily distinguished in the field even by the novice, and keeping respective slug and snail accounts together makes it easier to compare species when attempting to make determinations.

All land snails described in this field guide belong to the Phylum Mollusca, Class Gastropoda, and Order Stylommatophora. Introduced species are marked with an asterisk following the common name.

## Family Succineidae

### Genus *Catinella*

*Catinella rehderi* **Chrome Ambersnail**

*Catinella vermeta* **Suboval Ambersnail**

### Genus *Oxyloma*

*Oxyloma gouldi* **[No Common Name]**

*Oxyloma haydeni* **Niobrara Ambersnail**

*Oxyloma missoula* **Ninepipes Ambersnail**

*Oxyloma nuttallianum* **Oblique Ambersnail**

### Genus *Succinea*

*Succinea grosvenori* **Santa Rita Ambersnail**

## Family Cionellidae

### Genus *Cochlicopa*

*Cochlicopa lubrica* **Glossy Pillar**

## Family Valloniidae

### Genus *Zoogenetes*

*Zoogenetes harpa* **Boreal Top**

### Genus *Vallonia*

*Vallonia cyclophorella* **Silky Vallonia**

*Vallonia gracilicosta* **Multirib Vallonia**

*Vallonia perspectiva* **Thin-lipped Vallonia**

*Vallonia pulchella* **Lovely Vallonia\***

## Family Pupillidae

### Genus *Pupilla*

*Pupilla blandi* **Rocky Mountain Column**

*Pupilla hebes* **Crestless Column**

*Pupilla muscorum* **Widespread Column**

*Pupilla syngenes* **Top-heavy Column**

## Family Vertiginidae

Genus *Gastrocopta*

*Gastrocopta armifera* **Armed Snaggletooth**

*Gastrocopta holzingeri* **Lambda Snaggletooth**

*Gastrocopta pentodon* **Comb Snaggletooth**

Genus *Columella*

*Columella columella* **Mellow Column**

*Columella edentula* **Toothless Column**

Genus *Vertigo*

*Vertigo binneyana* **Cylindrical Vertigo**

*Vertigo concinnula* **Mitered Vertigo**

*Vertigo elatior* **Tapered Vertigo**

*Vertigo gouldi* **Variable Vertigo**

*Vertigo modesta* **Cross Vertigo**

*Vertigo ovata* **Ovate Vertigo**

## Family Haplotrematidae

Genus *Haplotrema*

*Haplotrema vancouverense* **Robust Lancetooth**

## Family Punctidae

Genus *Paralaoma*

*Paralaoma caputspinulae* **Pinhead Spot**

Genus *Punctum*

*Punctum californicum* **Ribbed Spot**

*Punctum minutissimum* **Small Spot**

## Family Charopidae

Genus *Radiodiscus*

*Radiodiscus abietum* **Fir Pinwheel**

## Family Discidae

Genus *Anguispira*

*Anguispira kochi* **Banded Tigersnail**

Genus *Discus*

*Discus brunsoni* **Lake Disc**

*Discus shimekii* **Striate Disc**

*Discus whitneyi* **Forest Disc**

## Family Oreohelicidae

Genus *Oreohelix*

*Oreohelix alpina* **Alpine Mountainsnail**

*Oreohelix amariradix* **Bitterroot Mountainsnail**

*Oreohelix carinifera* **Keeled Mountainsnail**

*Oreohelix elrodi* **Carinate Mountainsnail**

*Oreohelix haydeni* **Lyrate Mountainsnail**

*Oreohelix pygmaea* **Pygmy Mountainsnail**

*Oreohelix strigosa* **Rocky Mountainsnail**

*Oreohelix subrudis* **Subalpine Mountainsnail**

*Oreohelix yavapai* **Yavapai Mountainsnail**

## Family Pristilomatidae

Genus *Hawaiiia*

*Hawaiiia minuscula* **Minute Gem**

Genus *Pristiloma*  
*Pristiloma wascoense* **Shiny Tightcoil**

**Family Euconulidae**  
Genus *Euconulus*  
*Euconulus fulvus* **Brown Hive**

**Family Gastrodontidae**  
Genus *Striatura*  
*Striatura pugetensis* **Northwest Striate**  
Genus *Zonitoides*  
*Zonitoides arboreus* **Quick Gloss**  
*Zonitoides nitidus* **Black Gloss**

**Family Daudebardiidae**  
Genus *Nesovitrea*  
*Nesovitrea binneyana* **Blue Gloss**  
*Nesovitrea electrina* **Amber Gloss**  
Genus *Oxychilus*  
*Oxychilus alliarius* **Garlic Glass-snail\***  
*Oxychilus draparnaudi* **Dark-bodied Glass-snail\***

**Family Vitrinidae**  
Genus *Vitrina*  
*Vitrina pellucida* **Western Glass-snail**

**Family Limacidae**  
Genus *Limax*  
*Limax maximus* **Giant Gardenslug\***

**Family Agriolimacidae**  
Genus *Deroceras*  
*Deroceras laeve* **Meadow Slug**  
*Deroceras reticulatum* **Gray Fieldslug\***

**Family Arionidae**  
Genus *Magnipelta*  
*Magnipelta mycophaga* **Magnum Mantleslug**  
Genus *Arion*  
*Arion circumscriptus* **Brown-banded Arion\***  
*Arion fasciatus* **Orange-banded Arion\***  
*Arion intermedius* **Hedgehog Arion\***  
*Arion rufus* **Chocolate Arion\***  
*Arion subfuscus* **Dusky Arion\***  
Genus *Udosarx*  
*Udosarx lyrata* **Lyre Mantleslug**  
Genus *Zacoleus*  
*Zacoleus idahoensis* **Sheathed Slug**  
Genus *Hemphillia*  
*Hemphillia camelus* **Pale Jumping-slug**  
*Hemphillia danielsi* **Marbled Jumping-slug**  
Genus *Prophysaon*  
*Prophysaon andersoni* **Reticulate Taildropper**  
*Prophysaon humile* **Smoky Taildropper**  
Genus *Kootenaia*  
*Kootenaia burkei* **Pygmy Slug**

**Family Polygyridae**

Genus *Allogona*

*Allogona ptychophora* **Idaho Forestsnail**

Genus *Cryptomastix*

*Cryptomastix mullani* **Coeur d'Alene Oregonian**

*Cryptomastix sanburni* **Kingston Oregonian**

**Family Thysanophoridae**

Genus *Microphysula*

*Microphysula ingersolli* **Spruce Snail**

**Family Megomphicidae**

Genus *Polygyrella*

*Polygyrella polygyrella* **Humped Coin**

## A NOTE ON USE OF SLUG AND SNAIL KEYS

Separate keys are provided for the slugs and land snails. The difference between these two groups is largely subjective, because most slugs possess an internal shell or shell-like plate. If the animal is alive and has no obvious shell, then use the slug key. If the material at hand is an empty shell or a live individual with an obvious shell, then proceed to the land snail key.

Although a hand lens of 10-20X magnification is a valuable aid it may be insufficient for seeing important details on some of the smallest animals. In those cases, a dissecting microscope of up to 45X magnification and a good light source typically are necessary.

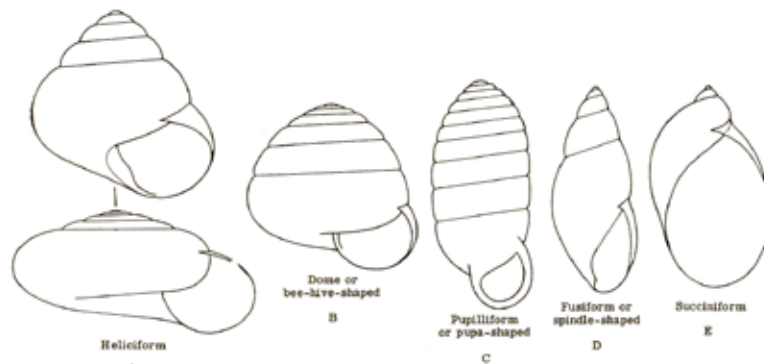
The following keys are necessarily incomplete and somewhat simplified. Do not be disappointed if every specimen is not easily identified with confidence. Immature snails and slugs can be especially confusing and may not fit species descriptions in the keys and species accounts, which pertain generally to mature animals. Conclusive determination of highly variable species in some cases requires dissection of the reproductive systems; this is especially true for distinguishing among most species of the wetland genera *Catinella*, *Oxyloma*, and *Succinea*, and

some of the exotic slugs in the genus *Arion*. Identifying genera and species of wetland snails usually requires the help of an expert, so the snail key does not distinguish among species in these genera, or among the genera themselves. References to descriptions of reproductive anatomy, when available, are listed with each species account. Persons interested in attempting their own dissections of slugs and wetland snails will also find useful comments or directions in Forsyth (2004) and Grimm et al. (2009).

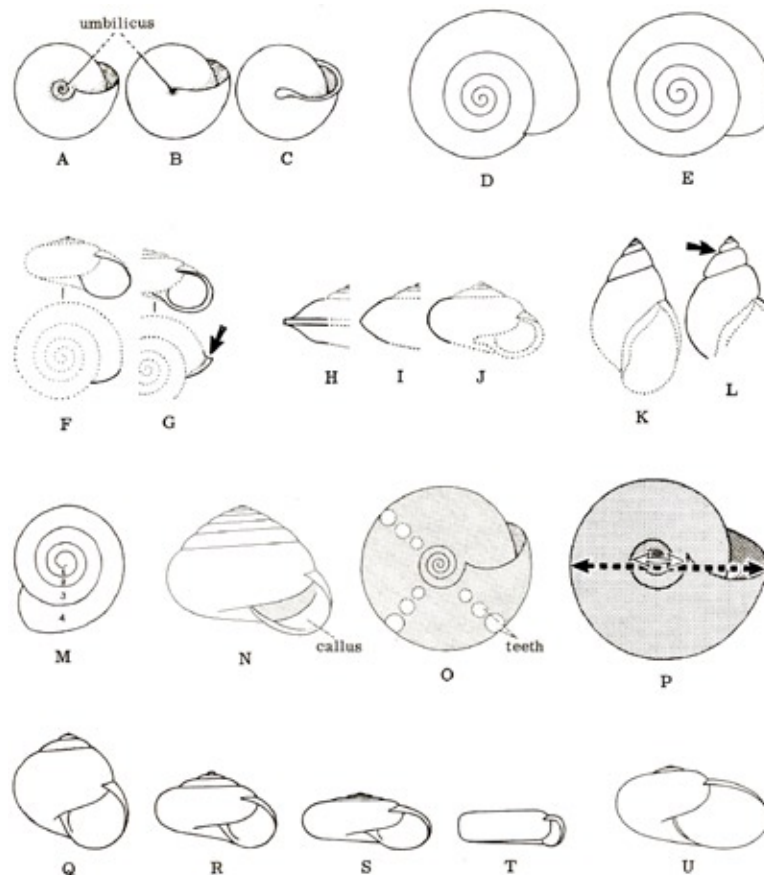
The dynamic state of systematics for some large and widespread groups, such as members of the families Pupillidae (*Pupilla*) and Vertiginidae (*Columella*, *Gastrocopta*, *Vertigo*), and the mountainsnail family Oreohelcidae (*Oreohelix*), contributes to the uncertainty of species determinations. However, future genetic analyses will probably lead to the recognition of several (likely disjunct) new species now considered to be a single wide-spread species. As an example, what is treated in this guide as *Oreohelix haydeni* follows the traditional designation, but in Montana it may later be shown to represent two or more closely related species, none of which is true *Oreohelix haydeni* (Frest and Johannes 1995).

# SLUG AND SNAIL TERMINOLOGY

Illustrations by Burch and Patterson (1966) used with permission.

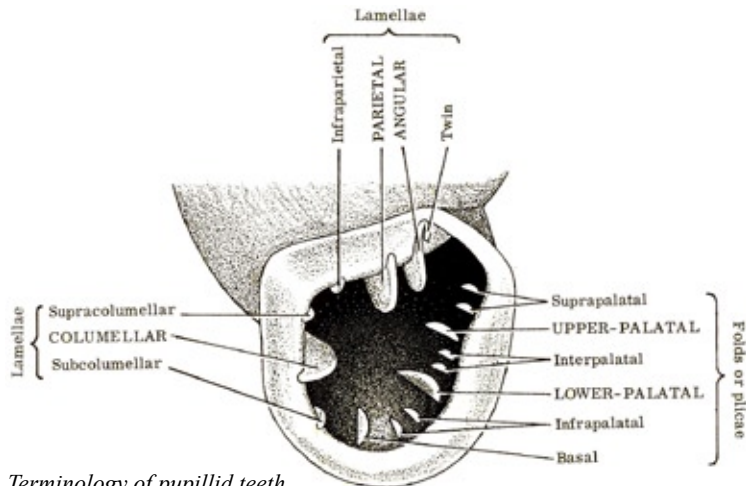


*A Variety of Shell shapes*

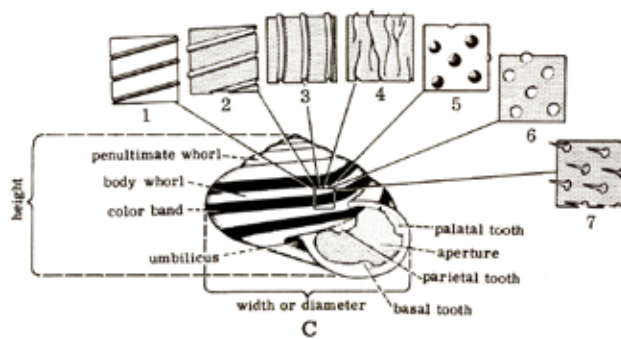
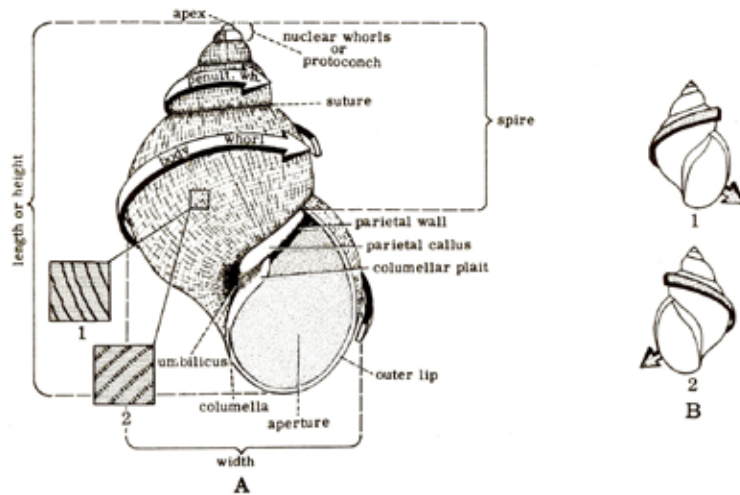


*Shell terminology. A, umbilicate shell; B, perforate shell; C, imperforate shell; D, shell with regularly increasing whorls; E, shell with slowly increasing whorls; F, straight (not reflected) lip; G, reflected lip; H, carinate periphery; I, angular periphery; J, round periphery; K, sutures slightly indented; L, sutures strongly indented; M, method of counting whorls; N, apertural view of shell showing callus; O, basal view of shell with teeth visible through the last whorl; P, method of measuring shell and umbilicus diameters; Q, globose shell; R, depressed shell; S, strongly depressed shell; T, discoidal shell; U, aperture larger than rest of shell when seen in side view.*





*Terminology of pupillid teeth.*



*Shell and slug terminology, and surface sculpture. A: 1, transverse or growth lines; 2, spiral lines or striae. B: 1, dextral shell (spiraled to the right); 2, sinistral shell (spiraled to the left). C: 1, striae (indented spiral lines); 2, lirae (raised spiral lines); 3, ribs (raised transverse lines); 4, wrinkles; 5, puncta or pits; 6, papillae or granules; 7, hairs or bristles.*

# KEYS

## Key to the Slugs of Montana

- 1a. Mantle elevated in a distinctive hump, internal shell often visible through a longitudinal mid-dorsal slit in the mantle (*Hemphillia*). 2
- 1b. Mantle not elevated in a distinctive hump, internal shell never exposed. 3
- 2a. Mantle often covered with prominent small papillae, base color blackish to tan, often with darker patches on the mantle and tail, tail relatively narrow with mid-dorsal stripe absent or relatively indistinct. **Marbled Jumping-slug** (*Hemphillia danielsi*)
- 2b. Mantle not covered with prominent papillae although anterior half may appear granulose, base color light brownish to pale tan, tail relatively broader with a well-defined pale mid-dorsal stripe. **Pale Jumping-slug** (*Hemphillia camelus*)
- 3a. Length of the mantle exceeds 2/3 the extended length of the animal. **Magnum Mantleslug** (*Magnipelta mycophaga*)
- 3b. Length of the mantle is less than 2/3 the extended length of the animal. 4
- 4a. Sole of foot tripartite (having two longitudinal furrows), back generally keeled near posterior end (especially when disturbed). 5
- 4b. Sole of foot undivided, back not keeled. 9
- 5a. Posterior mantle margin with a small notch on the right half, the pneumostome positioned above or anterior to the mantle-cleft. 6
- 5b. Posterior mantle margin lacking a small notch on the right half, the pneumostome positioned posterior to the mantle-cleft. 7
- 6a. Base color dark brown to dark purplish, with abundant pale blue flecking on the tail highlighting a fine pattern of reticulation on close inspection. **Sheathed Slug** (*Zacoleus idahoensis*)
- 6b. Base color bluish-gray to cream, contrasting with dark head and grooves on the tail demarcating rows of tubercles, dark lateral lines on the mantle converging posteriorly into a lyre shape. **Lyre Mantleslug** (*Udosarx lyrata*)
- 7a. Large, to 100 mm or more in extended length, base color yellowish-gray to tan or brown, with many black spots on mantle and tail sometimes merging into two or three pairs of broken lines. **Giant Gardenslug** (*Limax maximus*)
- 7b. Smaller, usually less than 50 mm extended body length, base color dark brown, grayish, or flesh colored, sometimes with darker patches on mantle and tail, mantle with a series of concentric fingerprint-like ridges on the right side (*Deroceras*). 8
- 8a. Base color grayish or cream-colored, usually with darker gray patches on mantle and tail, mucous milky when animal is irritated, up to 50 mm extended body length. **Gray Fieldslug** (*Deroceras reticulatum*)
- 8b. Base color dark brown to nearly black, mucous colorless, to about 25 mm extended body length. **Meadow Slug** (*Deroceras laeve*)
- 9a. Caudal mucous pore absent, mantle nearly 1/2 the extended body length. 10
- 9b. Caudal mucous pore present, mantle about 1/3 the extended body length. 12

- 10a. Pneumostome slightly posterior to middle of mantle on right side, base color gray or tan with pale blue flecking, mantle usually with dark spots or blotches, mucous clear, tail with a series of dark gray or brown parallel longitudinal stripes (grooves), sole and tail lacks a line of abscission (the site of tail autotomy) in the posterior quarter, adults very small, to 15 mm extended body length. **Pygmy Slug** (*Kootenaia burkei*)
- 10b. Pneumostome at or slightly anterior to middle of mantle on right side, base color yellowish-tan to reddish-orange with tan to black markings, the sole about the same base color as the upper surface, mantle appears granular, mucous yellow to orange when animal is irritated, the tail and sole with a line of abscission (the site of tail autotomy) often evident in the posterior quarter, adults to 70 mm extended body length (*Prophysaon*). 11
- 11a. Dorsal surface of the tail with a distinct diamond-mesh pattern of oblique furrows, usually highlighted with dark pigment, a lighter mid-dorsal stripe on the tail is narrow or indistinct. **Reticulate Tailedropper** (*Prophysaon andersoni*)
- 11b. Dorsal surface of the tail with an indistinct diamond-mesh pattern of oblique furrows, only partially highlighted with dark pigment, a lighter mid-dorsal stripe on the tail is broad and bounded by two darker and narrower bands. **Smoky Tailedropper** (*Prophysaon humile*)
- 12a. Base color pale gray to brownish-gray, sometimes with a light yellowish tint (*Arion*). 13
- 12b. Base color black, rusty brown, or orange (*Arion*). 15
- 13a. Base color pale yellowish-gray, mantle with pointed tubercles when contracted but lacking dark spots, lateral bands faint or lacking on mantle and tail, to about 20 mm extended length. **Hedgehog Arion** (*Arion intermedius*)
- 13b. Base color gray, mantle lacking pointed tubercles when contracted, mantle and tail with a distinct pair of brownish or darker gray lateral bands extending to near the posterior end, to about 40 mm extended length. 14
- 14a. Base color gray with a creamy or pale orangish tinge, mantle lacks small dark spots. **Orange-banded Arion** (*Arion fasciatus*)
- 14b. Base color gray to bluish-gray, mantle with numerous small dark spots. **Brown-banded Arion** (*Arion circumscriptus*)
- 15a. Base color black or rusty brown, tubercles very coarse, lateral bands absent in adults, mucous clear, very large, to 120 mm or more extended length. **Chocolate Arion** (*Arion rufus*)
- 15b. Base color brownish-yellow to orange, tubercles finer and in a series of rows, indistinct lateral bands present on the mantle and tail, extending to near the posterior end of the tail, mucous yellowish to orangish-yellow, to about 70 mm extended length. **Dusky Arion** (*Arion subfuscus*)

## Key to the Land Snails of Montana

- 1a. Shell height exceeds the width (lymnaeiform or pupiform). 2
- 1b. Shell height less than or equal to the width (heliceiform or beehive-shaped). 19
  
- 2a. Lymnaeiform, aperture height 1/2 or more of the shell height, about 3 whorls enlarging rapidly, fragile, translucent yellow or chalky. **Ambersnails** (*Catinella*, *Oxyloma*, *Succinea*)
- 2b. Pupiform, aperture height less than 1/2 the shell height. 3
  
- 3a. Aperture without teeth (denticles), lacking an external crest behind the aperture. 4
- 3b. Aperture with teeth (denticles), or with internal baffles or tubercles and an external crest behind the aperture. 7
  
- 4a. Shell cone-shaped with widely spaced lamellar axial ribs, height to about 3.3 mm.  

**Boreal Top** (*Zoogenetes harpa*)
- 4b. Shell more or less cylindrical or sub-cylindrical (not cone-shaped), height varies from 1.9 to about 6.5 mm. 5
  
- 5a. Aperture ovate with a thickened lip, shell smooth and very glossy, spire long and blunt at the apex, umbilicus absent, height more than 4.0 mm. **Glossy Pillar** (*Cochlicopa lubrica*)
- 5b. Aperture round, lip thin, shell not smooth and glossy, a small umbilicus present, height to about 3.0 mm (*Columella*). 6
  
- 6a. Shell distinctly more cylindrical with 6-7 whorls, the last or penultimate whorl before the aperture slightly smaller than the adjacent whorls giving the shell a pinched profile, height to about 3.0 mm. **Mellow Column** (*Columella columella*)
- 6b. Shell sub-cylindrical but clearly tapering to the apex, 5-6 whorls with the last nearly always larger than the preceding whorl, height to about 2.7 mm.  

**Toothless Column** (*Columella edentula*)
  
- 7a. Shell translucent whitish, height 1.9 to 4.5 mm (*Gastrocopta*). 8
- 7b. Shell amber brown or reddish brown, height 1.9 to 4.0 mm. 10
  
- 8a. Height to 4.5 mm, diameter greater than 2.0 mm, with 6 teeth (denticles) in aperture.  

**Armed Snaggletooth** (*Gastrocopta armifera*)
- 8b. Height to 2.0 mm, diameter to about 1.1 mm 9
  
- 9a. Typically 6 teeth, parietal tooth forked and shaped like the Greek letter lambda ( $\lambda$ ) from a basal view (shell broken away) with one end of the fork connected to the aperture lip, columellar tooth curves downward (basally) within the aperture, shell diameter to about 0.8 mm. **Lambda Snaggletooth** (*Gastrocopta holzingeri*)
- 9b. Typically 5 teeth but sometimes up to 8, parietal tooth not lambda-shaped, columellar tooth not curving downward within the aperture, shell diameter to about 1.1 mm.  

**Comb Snaggletooth** (*Gastrocopta pentodon*)
  
- 10a. Shell cylindrical with blunt ends, aperture rounded to ovate, palatal lip not indented, 6-9 whorls, shell height greater than 3.0 mm (*Pupilla*) 11
- 10b. Shell sub-cylindrical and tapering, aperture subovate, palatal lip usually indented, 4-5 whorls, shell height less than 3.0 mm (*Vertigo*) 14

- 11a. Shell without teeth, but possibly with a small bulge in place of a parietal tooth and a columellar baffle or tubercle. 12
- 11b. Shell with at least an obvious parietal tooth. 13
- 12a. Shell with a columellar baffle behind the columella, lip flared (expanded) but not thickened with a callus, crest the same color as the rest of the shell. **Crestless Column** (*Pupilla hebes*)
- 12b. Shell without a columellar baffle but possibly a small columellar tubercle present, lip slightly flared, whitish and thickened within by a low callus, crest well developed and whitish, paler than remainder of the shell. **Widespread Column** (*Pupilla muscorum*)
- 13a. Shell with 1-3 teeth (a small parietal tooth, sometimes a small palatal tooth and a blunt columellar tooth well within the aperture), 8-9 whorls, height to 4.0 mm and wider above, giving shell a top-heavy profile, whorls curve to the left (sinistral). **Top-heavy Column** (*Pupilla syngenes*)
- 13b. Shell with three teeth of about equal size (parietal, columellar, lower palatal deep within the aperture), 6-7 whorls, height to about 3.5 mm, whorls curve to the right (dextral). **Rocky Mountain Column** (*Pupilla blandi*)
- 14a. Sinulus more or less strongly indented in the aperture lip. 15
- 14b. Sinulus weak or absent. 16
- 15a. Aperture with 5 teeth, palatal callus slight or absent. **Tapered Vertigo** (*Vertigo elatior*)
- 15b. Aperture with 9 teeth, palatal callus heavy. **Ovate Vertigo** (*Vertigo ovata*)
- 16a. Palatal callus more or less distinct, sinulus weakly indented, shell height usually less than 2.2 mm. 17
- 16b. Palatal callus absent, sinulus very weak or absent, shell height usually greater than 2.2 mm. 18
- 17a. Aperture with 4-5 teeth (parietal, columellar, lower palatal, upper palatal, sometimes a subcolumellar), palatal callus more or less distinct. **Variable Vertigo** (*Vertigo gouldi*)
- 17b. Aperture with 6 teeth (parietal, columellar, lower palatal, upper palatal, angular, infrapalatal), palatal callus moderately developed. **Cylindrical Vertigo** (*Vertigo binneyana*)
- 18a. Aperture with 5 teeth, the parietal and palatal teeth elongate, sinulus very weak or absent, crest moderate to well-developed, shell height to about 2.3 mm. **Mitered Vertigo** (*Vertigo concinnula*)
- 18b. Aperture with 4-5 teeth (parietal, columellar, lower palatal, upper palatal, sometimes a small angular), but sometimes fewer, sinulus absent, crest weak to moderate, shell height to about 2.7 mm. **Cross Vertigo** (*Vertigo modesta*)
- 19a. Adult shell with a flared or reflected lip. 20
- 19b. Adult shell without a flared or reflected lip. 26
- 20a. Medium to large (to 20 mm diameter), shell translucent tan or opaque brown. 21
- 20b. Small (2.0 – 3.5 mm diameter), shell translucent white to pale brown (*Vallonia*). 23
- 21a. Aperture without teeth. **Idaho Forestsnail** (*Allogona ptychophora*)
- 21b. Aperture with at least a parietal tooth (*Cryptomastix*). 22

- 22a. Aperture only with small to well-developed and triangular parietal tooth, lip sometimes with whitish tooth-like thickenings. **Coeur d' Alene Oregonian** (*Cryptomastix mullani*)
- 22b. Aperture with a long and tall parietal tooth, a squarish palatal tooth, and a bluntly conic basal tooth. **Kingston Oregonian** (*Cryptomastix sanburni*)
- 23a. Aperture lip thickened. 24
- 23b. Aperture lip not thickened. 25
- 24a. Shell with widely-spaced axial ribs. **Multirib Vallonia** (*Vallonia gracilicosta*)
- 24b. Shell with occasional low wrinkles but not ribbed, shiny. **Lovely Vallonia** (*Vallonia pulchella*)
- 25a. Shell with regularly spaced blade-like axial ribs, umbilicus about 1/3 the shell diameter, diameter to 3.4 mm. **Silky Vallonia** (*Vallonia cyclophorella*)
- 25b. Shell with evenly-spaced ribs, umbilicus about 1/2 the shell diameter, diameter 2.0 mm or less. **Thin-lipped Vallonia** (*Vallonia perspectiva*)
- 26a. Shell translucent or transparent, generally smooth, sometimes with wrinkles or small striae but without prominent ribs. 27
- 26b. Shell opaque or with a color pattern, surface not smooth, generally with ribs or noticeable striae. 39
- 27a. Body whorl greatly enlarged (like a rams horn) to form more than half of the shell, shell fragile, to 6.0 mm diameter. **Western Glass-snail** (*Vitrina pellucida*)
- 27b. Body whorl not enlarged or somewhat enlarged but less than half the shell diameter. 28
- 28a. Umbilicus wide (1/3 or more the shell diameter). 29
- 28b. Umbilicus relatively narrow (1/4 or less the shell diameter). 30
- 29a. Shell less than 2.0 mm diameter, 3 to 3 1/2 whorls, inner 1 1/2 with fine spiral threads. **Northwest Striate** (*Striatura pugetensis*)
- 29b. Shell about 2.5 mm diameter, 4-5 whorls, inner 1 1/2 smooth. **Minute Gem** (*Hawaiiia minuscula*)
- 30a. Whorls about 5 and tightly coiled. 31
- 30b. Whorls not tightly coiled. 33
- 31a. Height of shell nearly as great as diameter, beehive-shaped, to 3.5 mm diameter. **Brown Hive** (*Euconulus fulvus*)
- 31b. Height of shell about half the diameter. 32
- 32a. Umbilicus minute and deep, spire slightly elevated, shell amber to brown, up to 5 whorls, diameter to 3.0 mm. **Shiny Tightcoil** (*Pristiloma wascoense*)
- 32b. Umbilicus 1/4 the shell diameter, spire flat, shell whitish, about 5 1/2 whorls, diameter to 5.0 mm. **Spruce Snail** (*Microphysula ingersolli*)
- 33a. Height of shell less than 1/2 the diameter, more than 5 whorls (*Oxychilus*). 34
- 33b. Height of shell greater than or equal to 1/2 the diameter, less than 5 whorls. 36

- 34a. Shell very smooth and glossy, diameter less than 8.0 mm, spire slightly raised, body and mantle dark gray to almost black, with a strong garlic odor when disturbed.  
**Garlic Glass-snail (*Oxychilus alliarius*)**
- 34b. Diameter usually greater than 8.0 mm, spire nearly flat, no garlic odor when live animal disturbed. 35
- 35a. Diameter 7.0-12.0 mm, last whorl expands evenly, body and mantle pale gray, the mantle spotted with brown flecks.  
**Cellar Glass-snail (*Oxychilus alliarius*)**
- 35b. Diameter 10.0-16.0 mm, shell with incremental lines and wrinkles, last whorl expanded more rapidly near the aperture (dorsal edge of lip overlaps previous whorl when seen from above) so that it appears twice as thick as the previous whorl, body and mantle dark bluish-gray.  
**Dark-bodied Glass-snail (*Oxychilus draparnaudi*)**
- 36a. Whorls increasing in size, the body whorl obviously enlarged even at 1/2 whorl back from aperture, shell transparent and shiny (*Nesovitrea*). 37
- 36b. Whorls much the same size especially 1/2 whorl back from aperture, shell amber or horn colored and translucent or cloudy (*Zonitoides*). 38
- 37a. Shell diameter less than 4.0 mm, colorless with a pale greenish tinge, the live animal pale grayish on head and tentacles.  
**Blue Glass (*Nesovitrea binneyana*)**
- 37b. Shell diameter greater than 4.0 mm, pale amber to brownish, the live animal dark to blackish on head and tentacles.  
**Amber Glass (*Nesovitrea electrina*)**
- 38a. Shell coloration somewhat transparent olive to brown, spire somewhat elevated, animal blackish, mantle with a dull orange spot visible through shell behind the aperture, diameter to 6.0 mm.  
**Black Gloss (*Zonitoides nitidus*)**
- 38b. Shell coloration translucent olive to brown, spire relatively flat, animal bluish gray on head and paler on sides and foot, lacking an orange spot on the mantle visible through the shell, diameter to 5.6 mm.  
**Quick Gloss (*Zonitoides arboreus*)**
- 39a. Composition of shell chitinous or horny, translucent or opaque, color greenish-yellow to brown. 40
- 39b. Composition of shell chalky, whitish or grayish, often with one or more brownish spiral bands, sometimes with pronounced sculpting of lirae or ribs (*Oreohelix*). 49
- 40a. Diameter greater than 15.0 mm, 5-6 whorls. 41
- 40b. Diameter less than 13.0 mm, 4-8 whorls. 42
- 41a. Height of shell greater than half the diameter (elevated spire), brownish with a light spiral band just above periphery and bordered by two obscure dark bands, live animal pale brown, diameter 17.0-28.0 mm.  
**Banded Tigersnail (*Anguispira kochi*)**
- 41b. Height of shell less than half the diameter (flattened spire), yellowish to olive-green, no spiral bands, live animal creamy white, diameter 20.0-30.0 mm.  
**Robust Lancetooth (*Haplotrema vancouverense*)**
- 42a. Shell diameter less than 2.5 mm, surface with closely-spaced axial riblets. 43
- 42b. Shell diameter greater than 4.5 mm, surface with or without axial ribs. 45

- 43a. Shell diameter greater than 2.0 mm, spire only slightly elevated, barely 4 whorls.  
**Pinhead Spot** (*Paralaoma caputspinulae*)
- 43b. Shell diameter less than 2.0 mm (*Punctum*). 44
- 44a. Shell diameter about 1.8 mm, spire moderately raised, aperture crescent-shaped, about 4 1/4 whorls.  
**Ribbed Spot** (*Punctum californicum*)
- 44b. Shell diameter about 1.5 mm, spire slightly raised, aperture roundedly crescent-shaped, about 4 whorls.  
**Small Spot** (*Punctum minutissimum*)
- 45a. Shell diameter to 13.0 mm and somewhat glossy, 7-8 closely-coiled whorls, the middle ones with strong axial ribs, aperture with a triangular parietal tooth and thickened lip, 1-2 radial rows of 3 teeth each within the last whorl and visible through the shell as lighter patches.  
**Humped Coin** (*Polygyrella polygyrella*)
- 45b. Shell diameter less than 10.5 mm, 4-6 whorls not closely coiled, shell without teeth. 46
- 46a. Apical 1 1/2 whorls with minute spiral striations, spire flat, umbilicus deep and narrow, aperture crescent-shaped.  
**Fir Pinwheel** (*Radiodiscus abietum*)
- 46b. Apical 1 1/2 whorls without minute spiral striations, spire somewhat elevated, umbilicus relatively wide, aperture rounded to ovate but not crescent-shaped (*Discus*) 47
- 47a. Diameter to about 10.5 mm, to 5 1/2 whorls, periphery strongly carinate, shell wrinkled and weakly ribbed on upper surface, basal surface almost smooth. **Lake Disc** (*Discus brunsoni*)
- 47b. Diameter less than 6.5 mm, to 4 1/2 whorls, periphery rounded or angular, prominent axial ribs present on upper surface. 48
- 48a. Axial ribs continuing from the upper surface of the shell onto the basal surface.  
**Forest Disc** (*Discus whitneyi*)
- 48b. Axial ribs rarely continuing from the upper surface of the shell past the periphery, giving the basal surface a smooth appearance.  
**Striate Disc** (*Discus shimekii*)
- 49a. Body whorl strongly keeled (carinate) wholly or in part at the periphery. 50
- 49b. Body whorl rounded or angular but lacking a keel at the periphery. 53
- 50a. Shell with a series of spiral raised ridges (lirae), brownish spiral bands absent.  
**Lyrate Mountainsnail** (*Oreohelix haydeni*)
- 50b. Shell lacks spiral raised ridges (lirae), with or without spiral bands. 51
- 51a. Shell with prominent coarse and irregular radial ribs on upper and lower surfaces.  
**Carinate Mountainsnail** (*Oreohelix elrodi*)
- 51b. Shells with wrinkles and spiral striae but lacking radial ribs. 52
- 52a. Diameter 16.0-23.0 mm, more than 5 whorls, umbilicus relatively broad (about 1/3 the diameter), aperture often very oblique and oval. **Yavapai Mountainsnail** (*Oreohelix yavapai*)
- 52b. Diameter less than 13.0 mm, up to 5 whorls, umbilicus relatively narrow (about 1/4 to 1/5 the diameter), aperture rounded to oval. **Keeled Mountainsnail** (*Oreohelix carinifera*)
- 53a. Diameter usually less than 13.0 mm. 54
- 53b. Diameter usually more than 13.0 mm. 56



- 54a. Spire low, no spiral striae, umbilicus about 1/5 the shell diameter, 8.0-11.0 mm diameter with about 4 ½ whorls, west of the Continental Divide at high elevations above treeline.  
**Alpine Mountainsnail (*Oreohelix alpina*)**
- 54b. Spire moderate to high, spiral striae present, umbilicus about 1/5 to 1/8 the shell diameter, 8.0 – 13.0 mm diameter with about 4 1/3 to 5 whorls, east of the Continental Divide. 55
- 55a. Spire high almost bee-hive shaped, 4 3/4 to 5 whorls, shell diameter 6-8 1/2 times diameter of umbilicus, surface with strong growth wrinkles, 9.0-11.0 mm diameter.  
**Pygmy Mountainsnail (*Oreohelix pygmaea*)**
- 55b. Spire moderate, 4 1/3 whorls, shell diameter about 5 1/2 times diameter of umbilicus, surface with weak growth wrinkles, 8.0 – 13.0 mm diameter.  
**Berry's Mountainsnail (*Oreohelix strigosa berryi*)**
- 56a. Spire low and rounded, to about 16.0 mm diameter, up to 5 1/2 whorls, body whorl somewhat angular except on the last 1/3 above the aperture, umbilicus 1/3 to 1/4 the shell diameter, west of the Continental Divide. **Bitterroot Mountainsnail (*Oreohelix amariradix*)**
- 56b. Spire usually moderate to high, 15.0-28.0 mm diameter, 5-6 whorls, umbilicus 1/4 to 1/7 the diameter, both sides of the Continental Divide. 57
- 57a. Spire usually moderate (low in *O. s. depressa*), 17.0-28.0 mm diameter (smaller for *O. s. berryi*; see above) with about 5 to 5 1/2 whorls, periphery rounded to angular, umbilicus 1/4 to 1/5 the diameter, weak to moderate growth wrinkles, variable spiral striae.  
**Rocky Mountainsnail (*Oreohelix strigosa*)**
- 57b. Spire typically high, 15.0-26.0 mm diameter with 5 to 6 whorls, periphery more or less rounded, umbilicus 1/5 to 1/7 the diameter, growth wrinkles fine and sharp, fine and close spiral striae.  
**Subalpine Mountainsnail (*Oreohelix subrudis*)**

## SPECIES ACCOUNTS - SLUGS

### *Limax maximus* - Giant Gardenslug

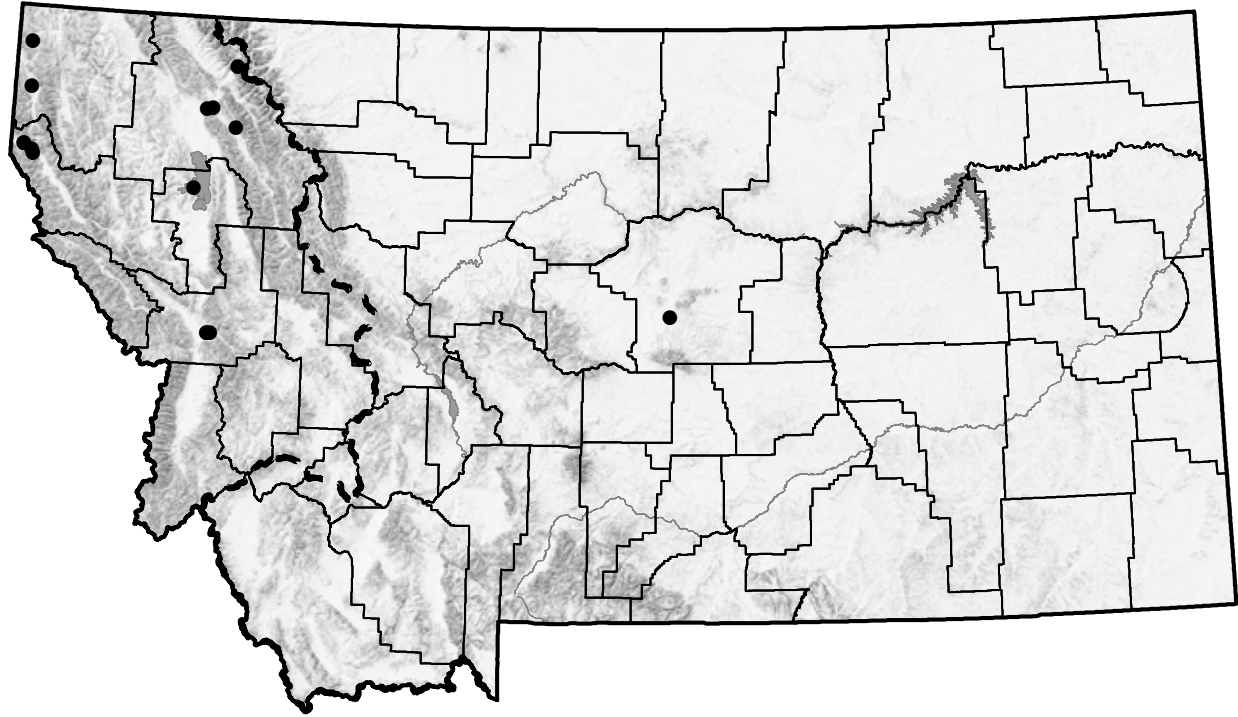


Photo by MTNHP

***Limax maximus* Linnaeus, 1758    Giant Gardenslug**

**Synonyms:** None.

**Subspecies:** None.

**Description:** A very large slug, adults reaching 100 mm or more when extended. Base color is yellowish-gray to brown, with many black spots on the mantle and tail, sometimes merging on the tail into two or three pairs of broken bands; head and sole are paler, tentacles darker. The mantle is 1/4 to 1/3 of the body length, and lacks a notch on the posterior margin. Pneumostome is in the posterior half of the mantle on the right side, and posterior to the mantle cleft. The sole is tripartite (having two longitudinal furrows), the tail is keeled only near the posterior end; the mucous is clear.

**Internal Anatomy:** Forsyth 2004; Pilsbry 1948.

**Distribution:** Native to Europe, Asia Minor, and North Africa; introduced to the Americas, Asia and Australia. In Montana, recorded in six counties across the state, mostly west of the Continental Divide, but likely occurs in many others, especially in towns and city parks. Elevation range is 579 to 1196 m (1900 to 3925 ft).

**Habitat:** Inhabits gardens and city parks near water and human habitation, sometimes out of town in campgrounds and valley-bottoms (for example, along Avalanche Creek in Glacier National Park and on Wild Horse Island in Flathead Lake). Forest canopy includes western redcedar, western hemlock, grand fir, Douglas-fir, paper birch, black cottonwood, secondary canopy of alder, willow, dogwood, and snowberry. Most often found under woody debris and leaf litter, sometimes in downed rotten wood or wood piles.

**Conservation Status:** Introduced; no special status in Montana (G5 SNA)

**Remarks:** Eats mainly fungus and decaying plant matter, not green plants. Mates while suspended from a mucous thread. One of the largest slugs in Montana; first reported in 1951. As many as eight were found at one site in Sanders County in mid-October.

**Selected References:** Forsyth 2004; Frest and Johannes 2001; Grimm et al. 2009; Pilsbry 1948.

*Deroceras laeve* - Meadow Slug

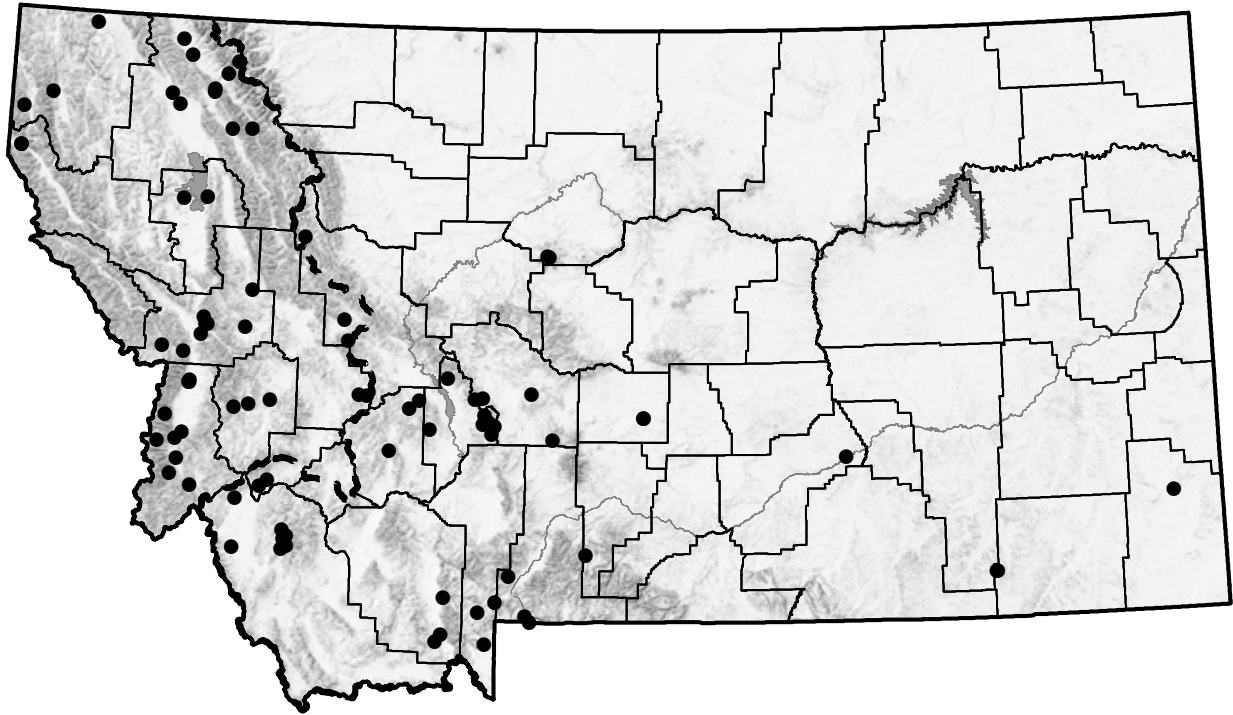


Photo by MTNHP

***Deroceras laeve* (Müller, 1774) Meadow Slug**

**Synonyms:** *Limax laevis*, *L. campestris*, *L. montanus*, *L. castaneus*, *L. hyperboreus*, *L. hemphilli*, *Agriolimax montanus*, *A. campestris*, *A. hemphilli*.

**Subspecies:** None.

**Description:** A small slug, with individuals reaching about 25 mm extended, but often smaller. Base color is dark brown to blackish on the head, mantle and tail, sometimes with very small dark irregular spots. The mantle is oval, about 2/5 of the body length, has a series of concentric ridges somewhat like a fingerprint, and lacks a notch along the posterior margin. The pneumostome is posterior to the mantle cleft and on the right side. The tail is covered with a series of small furrows and elongated tubercles, and is slightly keeled near the posterior end. The sole is pale and tripartite (having two longitudinal furrows), the mucous is clear.

**Internal Anatomy:** Forsyth 2004; Pilsbry 1948.

**Distribution:** Widespread throughout Europe, Asia, and the Americas. In Montana, recorded in 20 counties across the state, but likely occurring in every county. Elevation range is 674 to 2466 m (2210 to 8090 ft).

**Habitat:** Found in a variety of situations near moisture (wet meadows, marshes, streamside riparian), sometimes in sites without a tree canopy. Canopy tree species include a mixture of conifer and broadleaf types, including Engelmann spruce, Douglas-fir, lodgepole pine, black cottonwood, aspen, paper birch, ponderosa pine, western larch, western redcedar, western hemlock, rocky mountain juniper, with a secondary canopy including alder, willow, dogwood, and hawthorn. Most often found under woody debris and leaf litter, sometimes under rocks.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Most populations at higher elevations in forested regions are probably native; many other populations, especially in valleys and towns, possibly occur as a result of inadvertent introductions. As many as 20 were found at one site in Madison County in early October.

**Selected References:** Elrod 1901a; Forsyth 2004; Frest and Johannes 2001; Grimm et al. 2009; Hendricks 2009; Pilsbry 1948.



*Deroceras reticulatum* - Gray Fieldslug

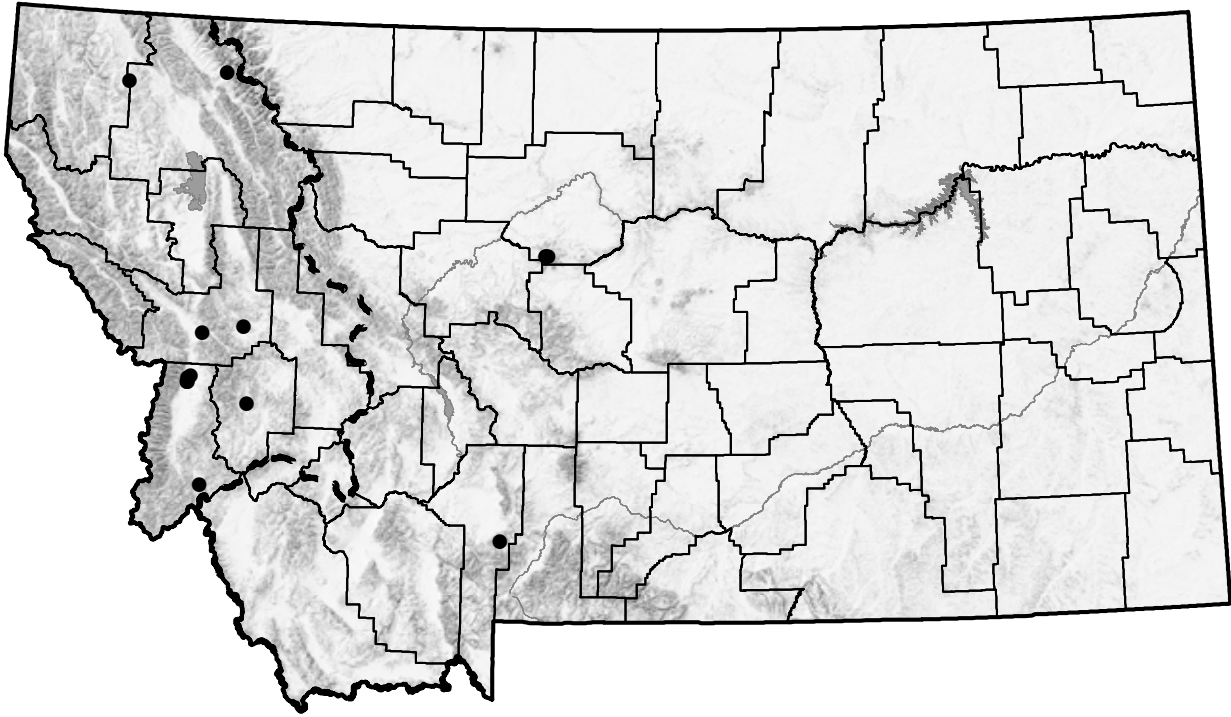


Photo by MTNHP

***Deroceras reticulatum* (Müller, 1774) Gray Fieldslug**

**Synonyms:** *Limax reticulatus*, *L. agrestis*, *L. tunicata*, *Agriolimax reticulatus*, *A. agrestis*.

**Subspecies:** None.

**Description:** A medium-sized slug, individuals reaching to about 50 mm extended. Base color is cream or flesh-colored on the head, mantle and tail, sometimes with darker flecking on the mantle and tail. The mantle is oval, about 1/3 to 2/5 of the body length, has a series of concentric ridges somewhat like a fingerprint, and lacks a notch along the posterior margin. The tail is covered with a series of small furrows and elongated tubercles, and is slightly keeled near the posterior end. The pneumostome is posterior to the mantle cleft and on the right side. The sole is pale and tripartite (having two longitudinal furrows); the mucous is clear when crawling but milky when animal is disturbed.

**Internal Anatomy:** Forsyth 2004; Pilsbry 1948.

**Distribution:** Native to southwestern Europe; introduced throughout Europe, Asia, Africa, Australia, and the Americas. In Montana, recorded in seven counties across the state, but likely occurs in many more, especially in yards and gardens. Elevation range is 962 to 1945 m (3155 to 6380 ft).

**Habitat:** Found in a variety of modified habitats near moisture (lawns, gardens, irrigated fields, and roadsides), sometimes in sites without a tree canopy. Canopy tree species include black cottonwood, ponderosa pine and aspen, with a secondary canopy including alder and willow. Most often found under woody debris, leaf litter and rocks as well as in lawns under planters and ornaments.

**Conservation Status:** Introduced; no special status in Montana (G5 SNA).

**Remarks:** Considered a serious agricultural and horticultural pest. As many as 15 individuals were found at one site in Chouteau County in late September, but many more likely occur at times in some residential and agricultural areas.

**Selected References:** Forsyth 2004; Frest and Johannes 2001; Grimm et al. 2009; Pilsbry 1948.

*Magnipelta mycophaga* - Magnum Mantleslug

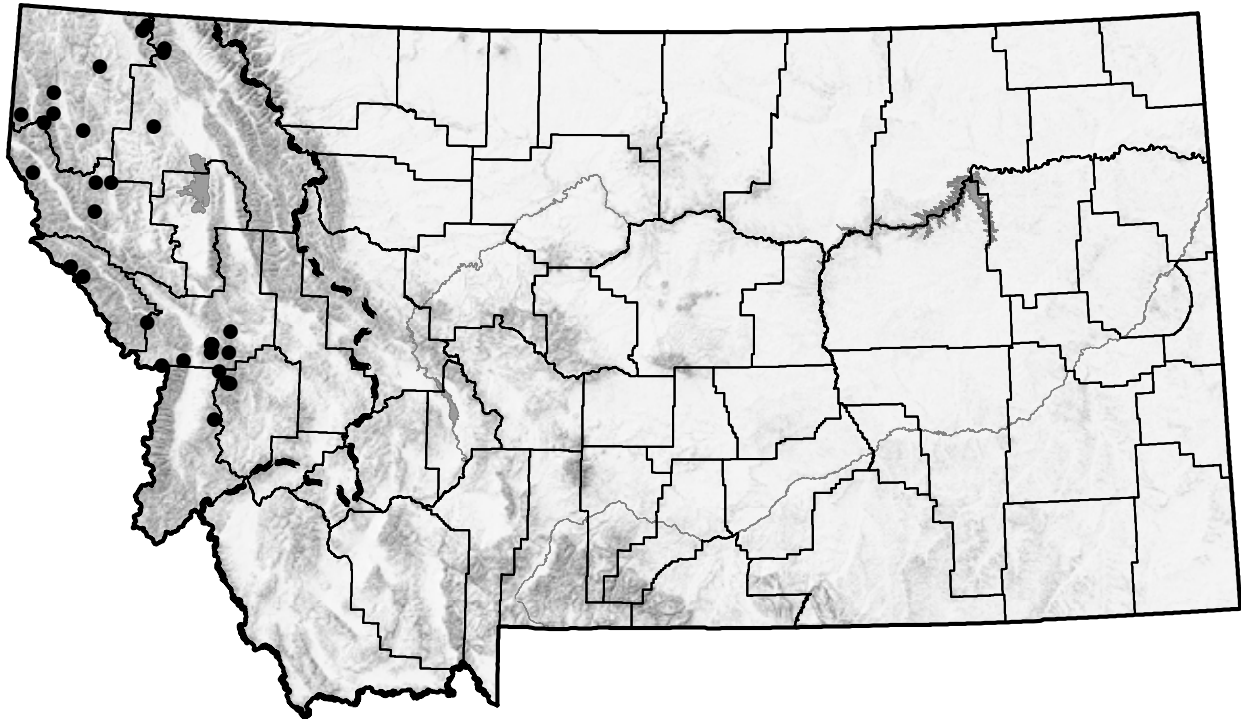


Photo by MTNHP



***Magnipelta mycophaga* Pilsbry, 1953    Magnum Mantleslug**

**Synonyms:** Montana-Idaho slug, Spotted slug.

**Subspecies:** None.

**Description:** A large slug unlikely to be confused regionally, up to 80 mm extended. Dorsal base color tan with scattered brown to black markings of varying density throughout and an irregular brown to black stripe on either side of the mantle, the mantle smooth and covering 2/3 or more of the body; no other slug in our region has such an extensive mantle covering. Anterior quarter of the mantle is free from the head. The pneumostome is slightly posterior to the midline of the mantle on the right side. The tail is unkeeled and the sole undivided (not tripartite); the mucous is clear.

**Internal Anatomy:** Pilsbry and Brunson 1954; Webb and Russell 1977.

**Distribution:** Southeastern British Columbia, northeastern Washington, northern Idaho and adjacent northwestern Montana west of the Continental Divide. In Montana, 35 records in seven counties: Flathead (3), Granite (3), Lincoln (7), Mineral (4), Missoula (11), Ravalli (2), Sanders (5). Elevation range is 840 to 2211 m (2756 to 7254 ft).

**Habitat:** Mostly mesic mixed conifer forest and riparian woodlands, sometimes with talus, also at higher elevation in drier sites with sufficient ground cover to maintain elevated soil moisture. Canopy species include Engelmann spruce, subalpine fir, lodgepole pine, Douglas-fir, western hemlock, western redcedar, grand fir, western larch, ponderosa pine, black cottonwood, with secondary canopy species including alder, willow, dogwood, and mountain maple. Usually found under rocks and woody debris, sometimes in rotten logs.

**Conservation Status:** Montana Species of Concern (G3 S2S3).

**Remarks:** Originally described from a specimen near Lolo Pass in Clearwater County, Idaho. Can be locally abundant; 32 individuals were found at one Missoula County, Montana site in late May and 86 at another in early June. Copulation in the wild has been observed in late May. Disturbed individuals may flare the anterior portion and sides of the mantle out and upward.

**Selected References:** Brunson and Kevern 1963; Forsyth 2004; Frest and Johannes 1995, 2001; Grimm et al. 2009; Hendricks 2003; Hendricks et al. 2007, 2008; Pilsbry 1953; Pilsbry and Brunson 1954; Webb and Russell 1977.

*Arion circumscriptus* - Brown-banded Arion

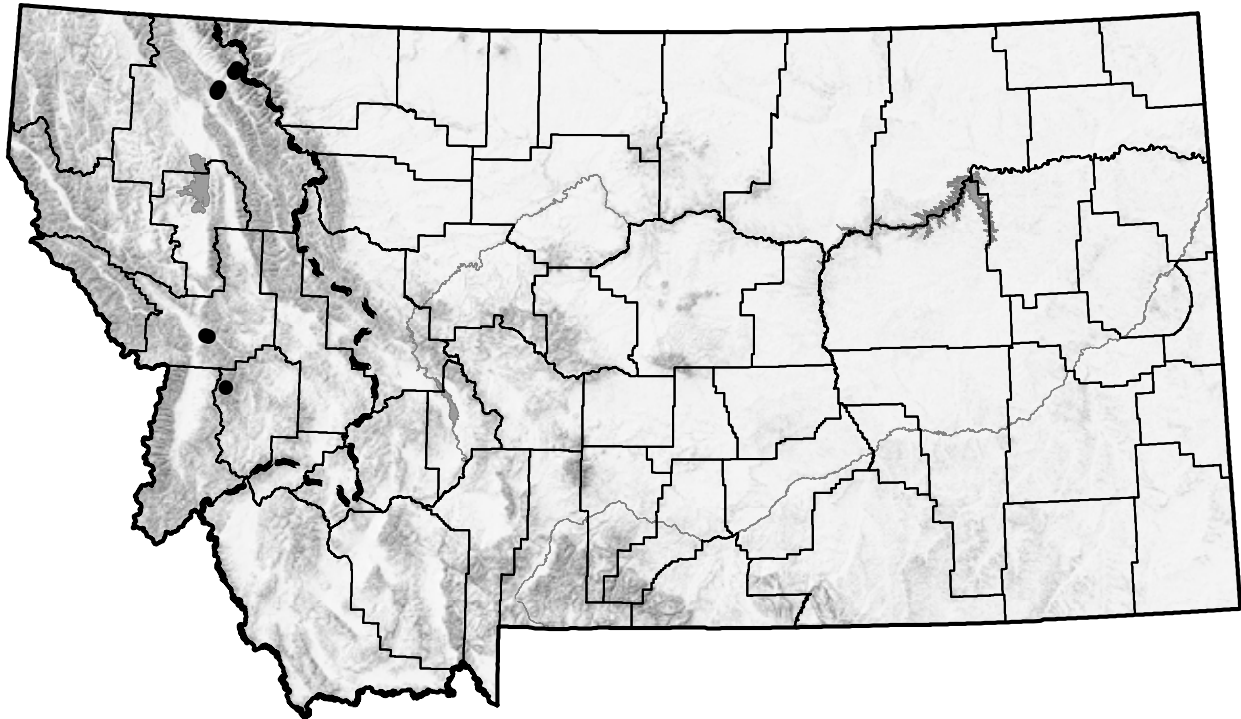


Photo by MTNHP

***Arion circumscriptus* Johnston, 1828 Brown-banded Arion**

**Synonyms:** *Arion fasciatus*, in part.

**Subspecies:** None.

**Description:** A small to medium-sized slug, reaching 25 to 40 mm extended. Dorsal base color is gray, sometimes lighter on the sides, tentacles dark. The mantle is granulose, about 1/3 the body length, and the same color as the back, marked with numerous small dark spots bounded by a pair of brownish lateral bands close to the mantle margin. The pneumostome is in the anterior half of the mantle on the right side, posterior to the mantle cleft. The tail has a pair of brownish or darker gray lateral bands extending to near the posterior end, lacks a mid-dorsal keel, and is covered dorsally with many fine tubercles in a series of rows. The sole is very pale, undivided (lacking two longitudinal furrows), the mucous clear and not sticky.

**Internal Anatomy:** Forsyth 2004; Pilsbry 1948.

**Distribution:** Native to Europe, introduced to North America. In Montana, reported from Flathead, Granite, and Missoula counties, all west of the Continental Divide, although records of *A. fasciatus* (Orange-banded Arion) from Lincoln and Missoula counties probably represent this species. Present at several locations in the McDonald Creek drainage of Glacier National Park. Elevation range is 963 to 1251 m (3160 to 4105 ft).

**Habitat:** Occupies moist to wet sites (stream-sides, marshy areas) within forested or shrubby locations, usually near areas of human activity, such as campgrounds, gardens and other disturbed sites. Canopy species include western redcedar, Engelmann spruce, western hemlock, grand fir, black cottonwood, aspen, mountain ash, and water birch, secondary canopy species include alder and mountain maple. Most often found under woody debris and rocks.

**Conservation Status:** Introduced, no special status in Montana (G5 SNA).

**Remarks:** Not reported in Montana prior to 2006, but with additional surveys in appropriate sites it will probably prove to be one of the most widely distributed *Arion* in areas of human activity west of the Continental Divide. As many as 25 individuals were reported at one Missoula County site in early May.

**Selected References:** Forsyth 2004; Frest and Johannes 2001; Grimm et al. 2009; Hendricks 2009; Pilsbry 1948.

*Arion fasciatus* - Orange-banded Arion

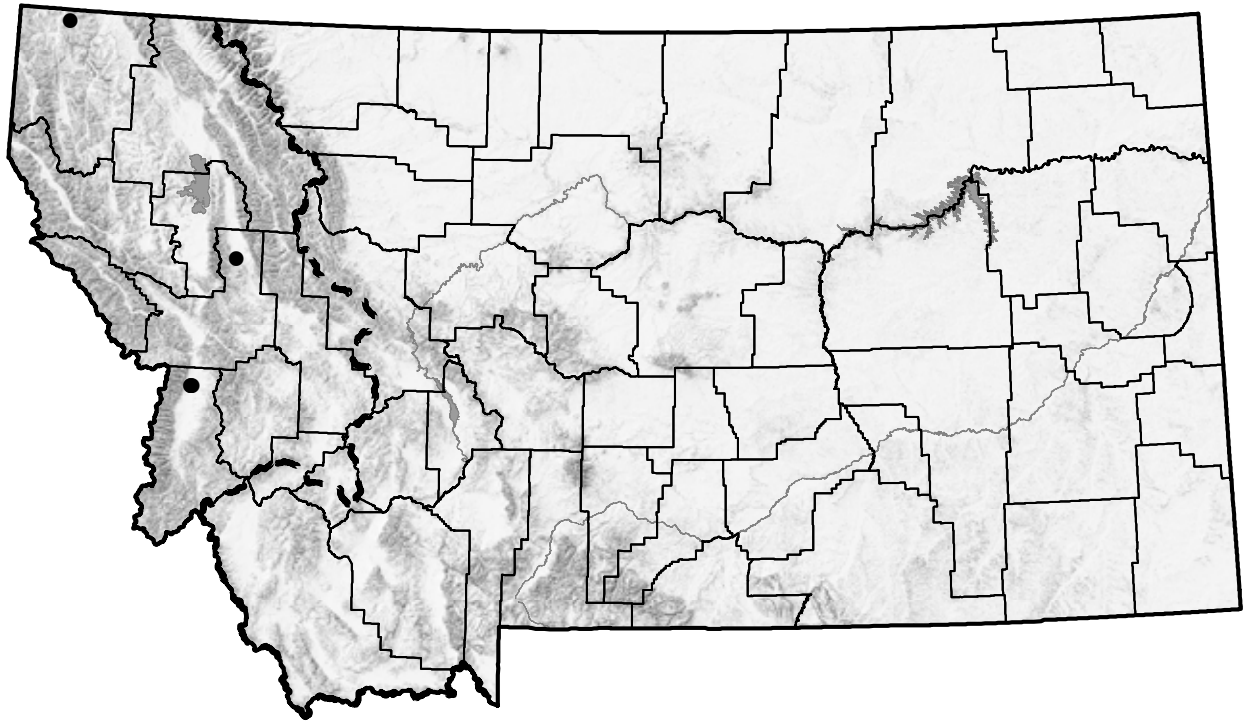


Photo by MTNHP

***Arion fasciatus* (Nilsson, 1823) Orange-banded Arion**

**Synonyms:** *Arion circumscriptus*, in part, *Arion fuscus*, *Limax fasciatus*.

**Subspecies:** None.

**Description:** A small to medium-sized slug, reaching 25 to 45 mm extended. The dorsal base color is gray to yellowish on the mantle, back, and sides, tentacles dark. The body is bell-shaped when contracted. The mantle is granulose, about 1/3 the body length, the same color as the back and lacking speckling; a pair of brownish lateral bands is present close to the mantle margin. The pneumostome is in the anterior half of the mantle on the right side, posterior to the mantle cleft. The tail has a pair of brownish or darker gray lateral bands extending to near the posterior end; the sides paler below the bands than above. The tail also lacks a mid-dorsal keel and is covered dorsally with a series of rows of fine tubercles; the row down the dorsal midline forms a narrow light stripe. The sole is quite pale, undivided (lacking two longitudinal furrows); the mucous is clear and not sticky.

**Internal Anatomy:** Forsyth 2004; Grimm et al. 2009; Pilsbry 1948.

**Distribution:** Native to Europe; introduced to North America. In Montana, reported from Lincoln, Missoula, and Ravalli counties, all west of the Continental Divide. Elevation range is 992 to 1324 m (3255 to 4345 ft).

**Habitat:** Occupies moist to wet sites (stream-sides, marshy areas) within forested or shrubby locations, usually near areas of human activity, such as campgrounds, gardens, and other disturbed sites. Canopy species include Engelmann spruce, Douglas-fir, lodgepole pine, ponderosa pine, western larch, black cottonwood, paper birch; secondary canopy species include alder and willow. Most often found under woody debris and rocks.

**Conservation Status:** Introduced, no special status in Montana (G5 SNA).

**Remarks:** Not reported in Montana prior to 2006, but with additional surveys in appropriate sites it will probably prove to be one of the more widely distributed *Arion* species in areas of human activity west of the Continental Divide. A recent genetic study suggests *A. circumscriptus* may be a variety of this species. As many as 110 individuals were reported at one Lincoln County site in early October.

**Selected References:** Forsyth 2004; Grimm et al. 2009; Pilsbry 1948.



*Arion intermedius* - Hedgehog Arion

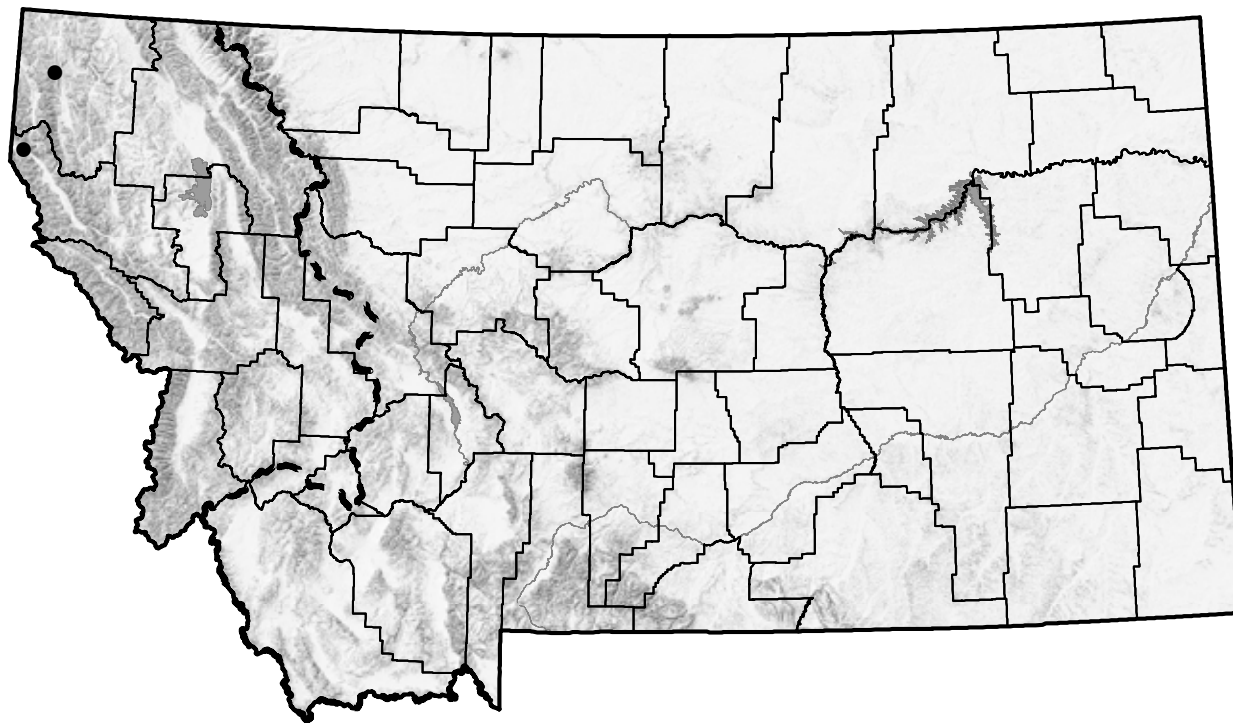


Photo by Bill Leonard

***Arion intermedius* Normand, 1852    Hedgehog Arion**

**Synonyms:** *Limax intermedius*.

**Subspecies:** None.

**Description:** A small slug, reaching 15-25 mm extended. Dorsal base color usually pale yellowish-gray, the head and tentacles darker, the mantle more yellow in the anterior half. The mantle is about 1/3 the body length, and covered with a series of small tubercles that form sharp translucent points when the animal is contracted; lateral bands are very pale or absent. The pneumostome is in the anterior half of the mantle on the right side, posterior to the mantle cleft. There is no mid-dorsal keel on the tail, lateral bands on the tail are pale or absent. The sole is pale yellow to pale orange; the mucous is yellowish to orangish-yellow. Because of small adult size, it can be confused with juveniles of other *Arion* species.

**Internal Anatomy:** Cadiz and Gallardo 2007; Pilsbry 1948.

**Distribution:** Native to central and northern Europe; introduced in Polynesia, Australia and New Zealand, northern Africa, and the Americas. In Montana, reported west of the Continental Divide in Lincoln and Sanders counties from two U. S. Forest Service campgrounds. Elevation range is 672 to 1067 m (2205 to 3500 ft).

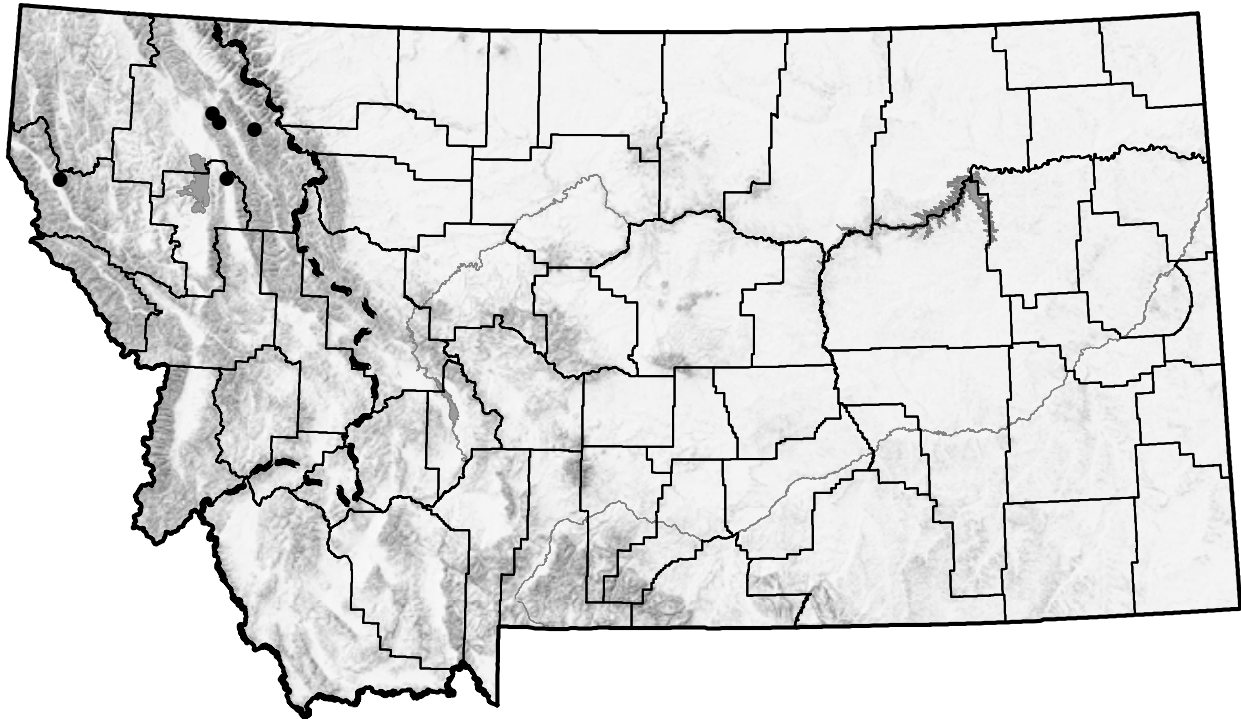
**Habitat:** Occupies moist areas within forested or shrubby locations, such as stream-sides and marshy areas and lake shore near areas of human activity, such as campgrounds and other disturbed sites, also gardens and parks in residential areas. Forest canopy in Montana includes western redcedar, Engelmann spruce, and western larch, with a secondary canopy of alder. Most often found under woody debris and leaf litter.

**Conservation Status:** Introduced; no special status in Montana (G5 SNA).

**Remarks:** Not reported in Montana prior to 2006, but with additional surveys in appropriate areas of human activity it probably will prove to be more widespread. May be locally abundant; 36 individuals reported at the Sanders County site and 39 at the Lincoln County site, both in early October.

**Selected References:** Forsyth 2004; Frest and Johannes 2001; Grimm et al. 2009; Pilsbry 1948.

*Arion rufus* - Chocolate Arion



*Photo by John Carlson*



***Arion rufus* (Linnaeus, 1758) Chocolate Arion**

**Synonyms:** *Arion ater*, *Limax rufus*.

**Subspecies:** None.

**Description:** A very large slug, reaching 150 mm or more when extended, although many individuals are smaller. Dorsal base color is various shades of black (the typical color), brown, or orange, juveniles more variable than adults; generally lacking dorsal patterning (bands, stripes, spots). The mantle is the same color as the tail and covers about 1/3 of the body. The pneumostome is in the anterior half of the mantle margin on the right side, posterior to the mantle cleft. The tail lacks a keel but is covered dorsally by many irregular, coarse and long tubercles arranged in many oblique rows. The sole is pale and undivided (lacking two longitudinal furrows); the mucous is clear.

**Internal Anatomy:** Forsyth 2004; Pilsbry 1948.

**Distribution:** Native to western and central Europe; introduced in many other regions worldwide, including the Americas. In Montana, reported from just a few areas west of the Continental Divide, in Flathead, Glacier, Lake, and Sanders counties. Elevation range is 672 to 1158 m (2205 to 3800 ft).

**Habitat:** Occupies moist to wet sites (stream-sides, fens, marshy areas) within forested or shrubby locations, usually near areas of human activity, such as campgrounds and residences. Canopy species include western redcedar, western larch, Douglas-fir, paper and water birch, and black cottonwood; secondary canopy species include willow and dogwood.

**Conservation Status:** Introduced; no special status in Montana (G4G5 SNA).

**Remarks:** All Montana reports are of the black form. May be locally abundant; several hundred were reported at one Flathead County site in early July, including individuals to 100 mm or more in length. Its full distribution is probably underrepresented by recent surveys.

**Selected References:** Forsyth 2004; Frest and Johannes 2001; Grimm et al. 2009; Hendricks 2009; Pilsbry 1948.

*Arion subfuscus* - Dusky Arion

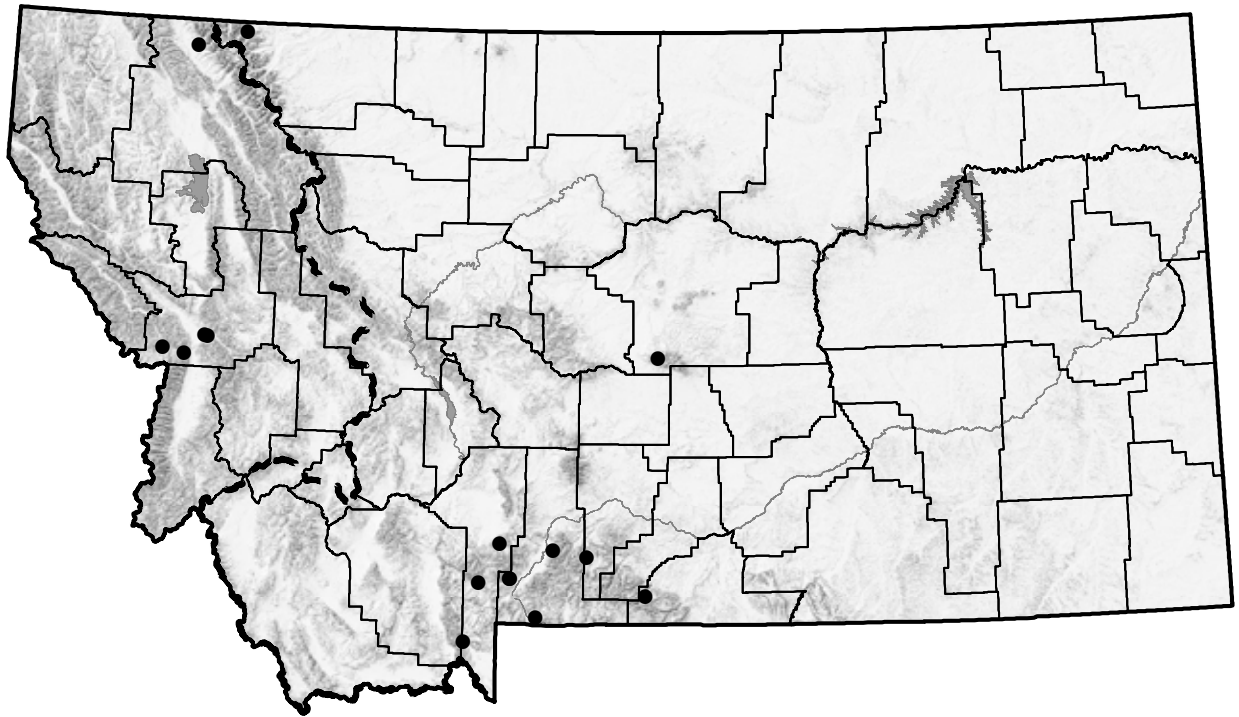


Photo by MTNHP

***Arion subfuscus* (Draparnaud, 1805) Dusky Arion**

**Synonyms:** *Limax subfuscus*, *Arion hortensis* in part, *Arion fuscus*.

**Subspecies:** None.

**Description:** A medium to large slug, reaching 70 mm extended, but often smaller. Dorsal base color is brownish-yellow to pale orange, the tentacles dark. The mantle is granulose, about 1/3 the body length, and the same color as the tail, with a lighter region along the margin and an indistinct pair of brown lateral bands. The pneumostome is in the anterior half of the mantle on the right side, posterior to the mantle cleft. The tail has a pair of brownish lateral bands extending to the posterior end, lacks a mid-dorsal keel, and is covered dorsally with many fine tubercles in a series of rows. The sole is pale, undivided (lacking two longitudinal furrows); the mucous is yellowish to orangish-yellow.

**Internal Anatomy:** Pilsbry 1948.

**Distribution:** Native in Europe; introduced to North America. In Montana, reported on both sides of the Continental Divide from seven counties, from Glacier National Park (Flathead County) in the northwest to the Boulder River (Sweet Grass County) in the southeast; a Montana report of *A. distinctus* (Darkface Arion) is probably this species. Elevation range is 1017 to 2004 m (3340 to 6575 ft).

**Habitat:** Occupies moist to wet sites (stream-sides, marshy areas, flood plains) within forested or shrubby locations, usually near areas of human activity, such as campgrounds, gardens, and other disturbed sites. Canopy species include Engelmann spruce, Douglas-fir, black cottonwood, aspen, lodgepole pine, ponderosa pine, and grand fir; secondary canopy species include alder, willow, and dogwood. Most often found under woody debris and rocks or in rotten wood.

**Conservation Status:** Introduced; no special status in Montana (G5 SNA).

**Remarks:** Not reported in Montana prior to 2005, but with additional surveys it probably will prove to be one of the most widely distributed species of *Arion* in areas of human activity and disturbance. As many as 43 individuals were reported at one Gallatin County site in late August, where numerous egg masses were found in rotten wood. Eggs are globular and a dull yellow color, occurring in clusters of 10-20.

**Selected References:** Forsyth 2004; Frest and Johannes 2001; Grimm et al. 2009; Hendricks 2009; Pilsbry 1948.

*Udosarx lyrata* - Lyre Mantleslug

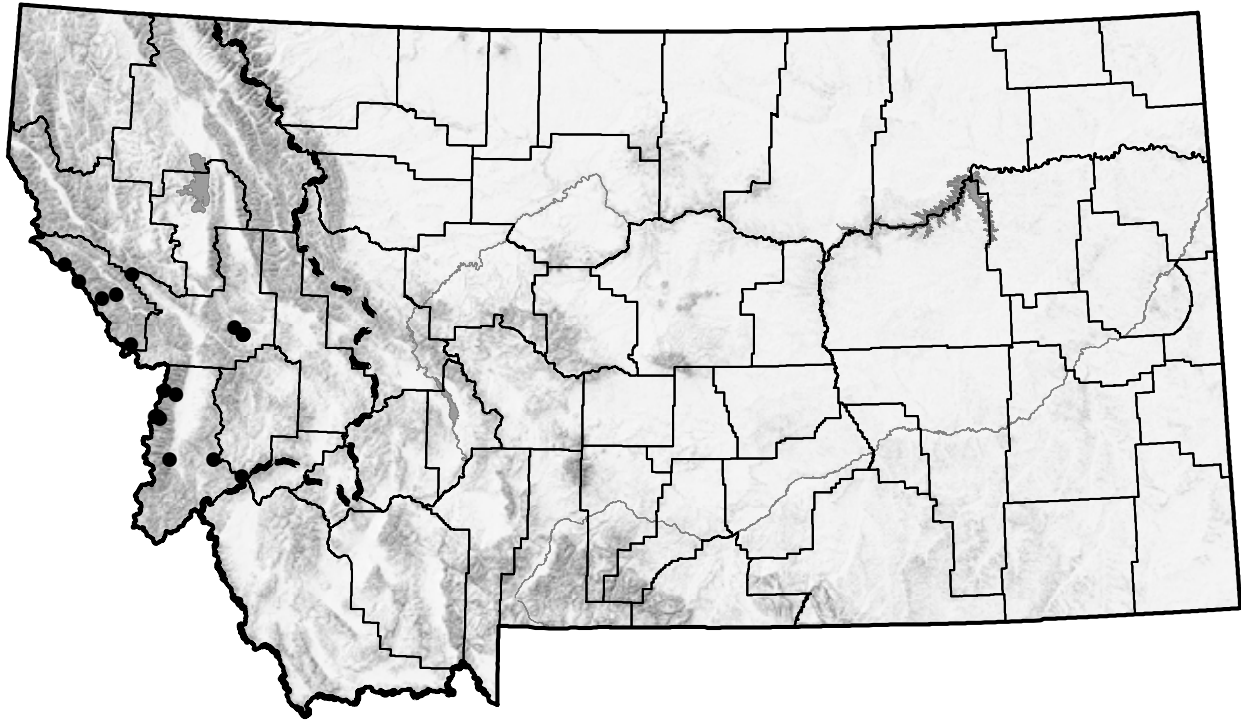


Photo by MTNHP

***Udosarx lyrata* Webb, 1959    Lyre Mantleslug**

**Synonyms:** None.

**Subspecies:** *U. l. lyrata*: from specimens collected 4.0 km west of the crest of Lolo Pass, Clearwater County, Idaho (Webb 1959); *U. l. russelli*: from specimens collected 1.6 km west of Potomac, Missoula County, Montana (Russell and Webb 1980). The taxonomic validity of subspecies needs reevaluation.

**Description:** A small slug, animals may reach 30 mm or more, but are often smaller. Body and mantle base-color is cream, head and lateral grooves (7-8) on the body are dark to black, the latter highlighting a mid-dorsal tawny strip on the tail. The posterior margin of the mantle is deeply notched, similar to *Zacoleus*, and the pneumostome is present above or anterior to the mantle cleft. The mantle covers less than half the body, and has blackish lateral lines on the posterior half that converge towards the posterior margin, with small black spots on the anterior half of the mantle vaguely delineating a grid pattern. The right mantle line is sometimes more sinuous than the left, and the two converging lines form a lyre-shaped symbol—hence the species name, *lyrata*. The back has a prominent keel especially noticeable in contracted individuals. The sole is tripartite (having two longitudinal furrows); the mucous is clear.

**Internal Anatomy:** Russell and Webb 1980; Webb 1959.

**Distribution:** Northern Idaho and adjacent northwestern Montana west of the Continental Divide. In Montana, 19 records in three counties: Mineral (5), Missoula (5), Ravalli (9). Elevation range is 928 to 2542 m (3045 to 8340 ft).

**Habitat:** Mostly mesic mixed conifer forest and riparian woodlands, sometimes with talus, also at higher elevation in drier habitat where snow banks and seeps keep soil moister. Canopy species include Engelmann spruce, subalpine fir, whitebark pine, Douglas-fir, ponderosa pine, lodgepole pine, western larch, western hemlock, western redcedar, black cottonwood and paper birch, secondary canopy includes alder, willow, mountain maple, and dogwood. Usually found under rocks and woody debris, sometimes within rotten logs.

**Conservation Status:** Montana Species of Concern (G2 S1).

**Remarks:** May be locally abundant; up to 17 individuals were found at one Missoula County site in early May. Courtship and copulation have been observed in captive animals in November.

**Selected References:** Frest and Johannes 1995, 2001; Hendricks 2003; Hendricks et al. 2006, 2007, 2008; Russell and Webb 1980; Webb 1959.



*Zacoleus idahoensis* - Sheathed Slug

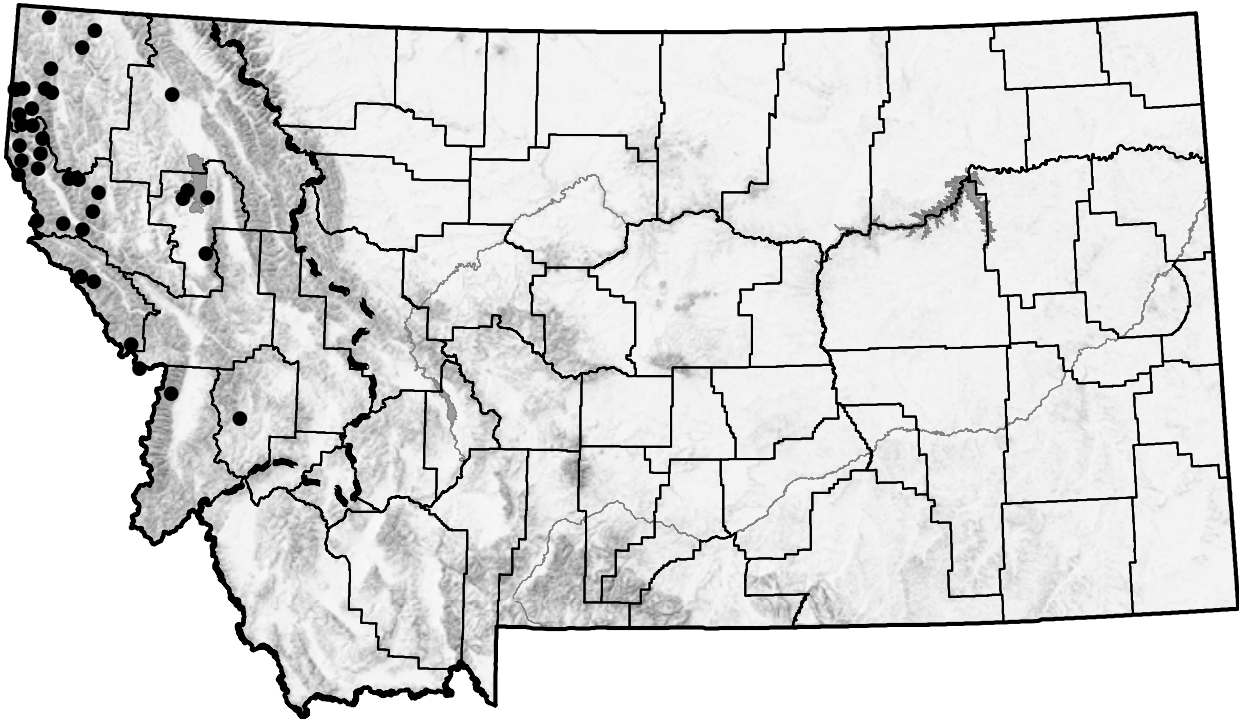


Photo by MTNHP

***Zacoleus idahoensis* Pilsbry, 1903    Sheathed Slug**

**Synonyms:** None.

**Subspecies:** None.

**Description:** A small slug, animals may reach 30 mm or more, but are often smaller. The overall appearance is dark. Base color on the mantle and back is dark brown to dark purplish, with abundant bluish flecking on closer inspection, on the tail highlighting a fine pattern of reticulation. The head and tentacles appear uniformly darker than the mantle and tail on some individuals. The mantle covers less than half the length of the body. The posterior margin of the mantle is deeply notched, similar to *Udosarx*. The pneumostome present in the posterior half of the mantle margin on the right side, above or slightly anterior to the mantle cleft. The reticulation on the posterior half of the body (tail) is indistinct, predominately with longitudinal lines above and oblique on the sides. The back of the tail has a prominent keel especially noticeable in contracted animals. The sole is tripartite (having two longitudinal furrows); the mucous is clear.

**Internal Anatomy:** Pilsbry 1948.

**Distribution:** Northern Idaho, extreme western Washington, and adjacent northwestern Montana west of the Continental Divide. In Montana, 37 records in eight counties: Flathead (1), Granite (1), Lake (4), Lincoln (12), Mineral (3), Missoula (1), Ravalli (1), Sanders (14). Elevation range is 674 to 1775 m (2210 to 5725 ft).

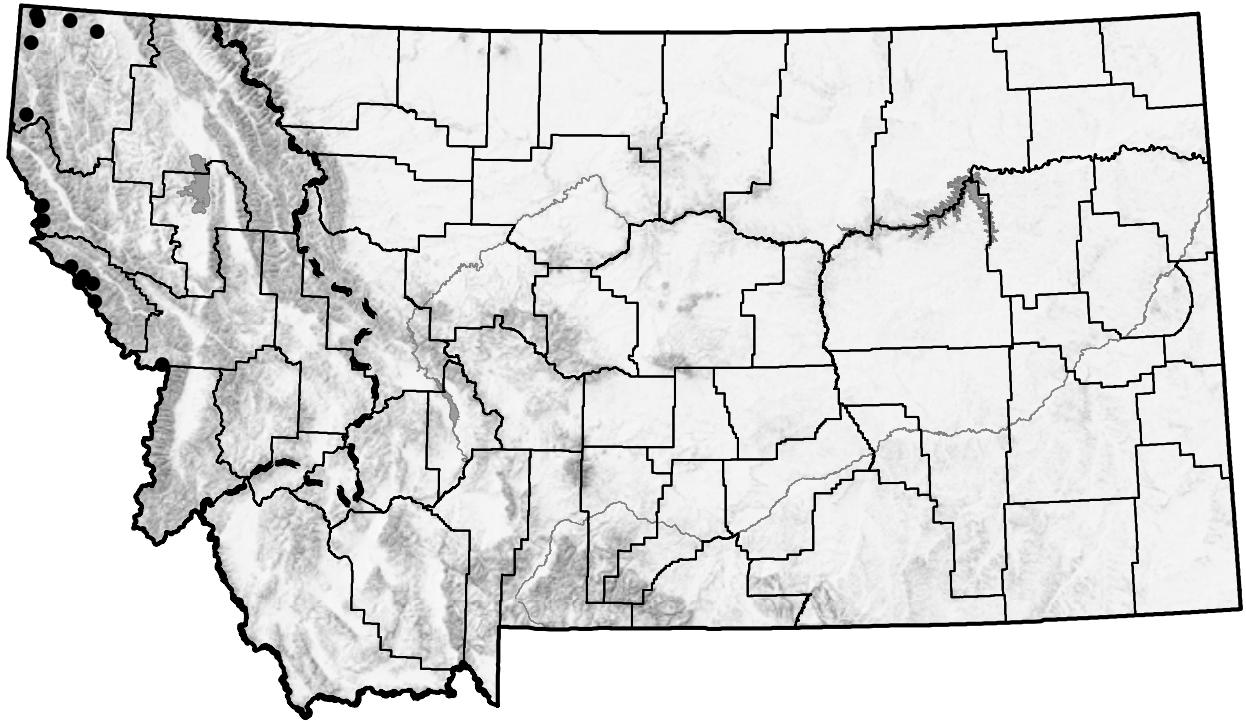
**Habitat:** Primarily in mesic mixed conifer forest, often near water such as stream-side riparian areas and seeps, but also in more xeric sites. Canopy species include western redcedar, western hemlock, grand fir, Engelmann spruce, Douglas-fir, western larch, ponderosa pine, lodgepole pine, black cottonwood, paper birch, with a secondary canopy of alder, willow, and dogwood. Usually found under woody debris and leaf litter or in downed rotten wood, sometimes under rocks.

**Conservation Status:** Montana Species of Concern (G3G4 S2S3).

**Remarks:** The original description was based on animals from Meadows, Adams County, Idaho. Up to 11 individuals were found at one Lincoln County, Montana site in mid-October.

**Selected References:** Frest and Johannes 1995, 2001; Hendricks et al. 2006, 2007, 2008; Pilsbry 1948; Smith 1943.

*Hemphillia camelus* - Pale Jumping-slug



*Photo by MTNHP*



***Hemphillia camelus* Pilsbry & Vanatta, 1897    Pale Jumping-slug**

**Synonyms:** None.

**Subspecies:** None.

**Description:** A moderately large slug of about 55 mm extended, but may reach 80 mm. As with all species of *Hemphillia*, the shell is partly exposed through a slit on the mantle about one-third its length, the mantle elevated into a visceral hump and sometimes covered with small bumps. Dorsal base color is pale cream-colored to golden-brownish or pale gray; head coloration is pale brown or cream centrally, sometimes with an irregular single grayish lateral stripe on each side; small irregular markings on the mantle form lateral stripes. The pneumostome is posterior to the midline of the mantle on the right side. The foot is somewhat narrow, with a median groove and tail pore near the posterior end, sometimes a low keel. The sides of the foot with a uniform series of indistinct oblique grooves covered with brownish or grayish patches that highlight a cream-colored or pale brown mid-dorsal stripe. The sole is undivided (not tripartite); the mucous can be milky in disturbed individuals.

**Internal Anatomy:** Pilsbry 1948.

**Distribution:** Southeastern British Columbia, northeastern Washington, northern Idaho, and adjacent northwestern Montana west of the Continental Divide. In Montana, 14 records in four counties: Lincoln (6), Mineral (5), Missoula (1), Sanders (2). Elevation range is 764 to 1920 m (2505 to 6300 ft).

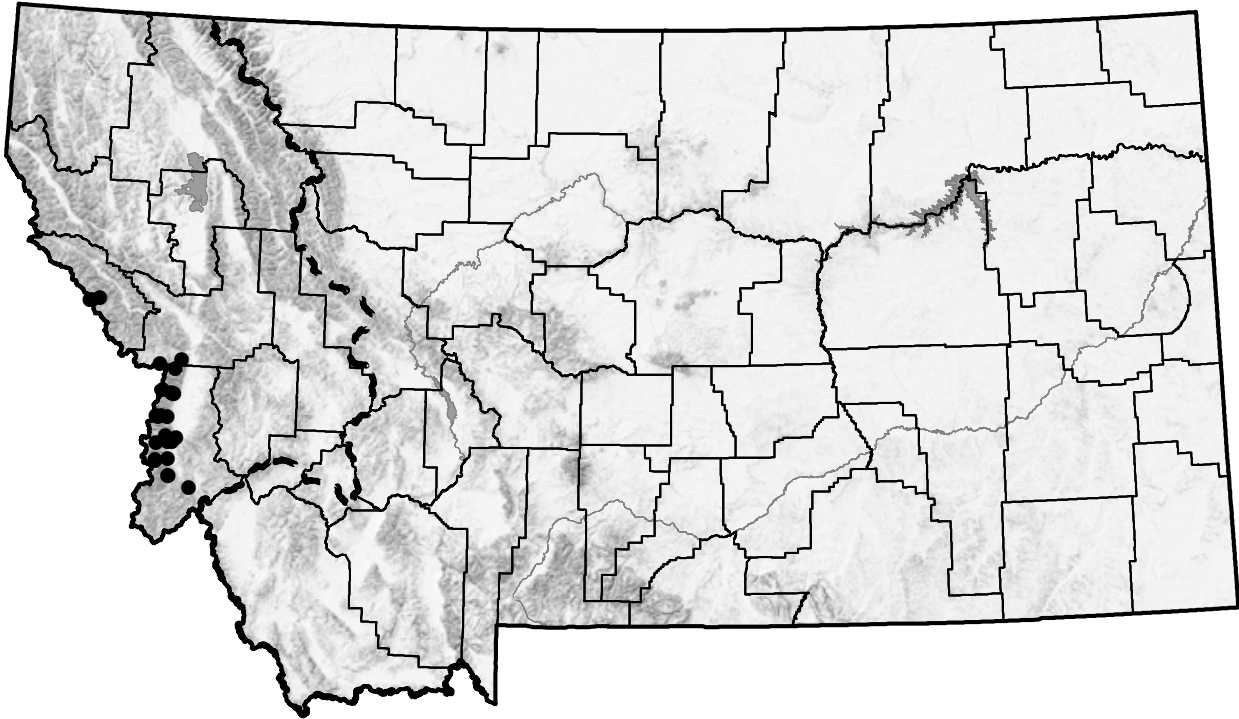
**Habitat:** Mostly in mesic mixed conifer forest, typically near water such as stream-side riparian areas and seeps. Canopy species include western redcedar, western hemlock, Engelmann spruce, subalpine fir, grand fir, Douglas-fir, alder, birch, and black cottonwood. Usually found under woody debris and leaf litter or in downed rotten logs, sometimes under rocks.

**Conservation Status:** Montana Species of Concern (G4 S1S2).

**Remarks:** Originally described from animals taken at Old Mission, Kootenai County, Idaho. Sometimes responds to disturbance by thrashing the foot side to side and flipping themselves, hence the name jumping-slug. Up to eight individuals were found at a one Lincoln County site in early October. Copulation and egg-laying in the wild was observed in late September, the eggs in clusters of 10-25 and opaque white; a captive individual laid eggs in mid-December. Animals found in the wild as juveniles have lived more than 16 months in captivity. First reported from Montana in 2004.

**Selected References:** Forsyth 2004; Frest and Johannes 2001; Grimm et al. 2009; Hendricks et al. 2006, 2007, 2008; Pilsbry 1948; Smith 1943.

*Hemphillia danielsi* - Marbled Jumping-slug



*Photo by MTNHP*

***Hemphillia danielsi* Vanatta, 1914    Marbled Jumping-slug**

**Synonyms:** None.

**Subspecies:** None.

**Description:** A moderately large slug of about 45 mm extended, but may reach 65 mm.

As with all species of *Hemphillia*, the shell is partly exposed through a slit on the mantle about one-third its length, the mantle elevated into a visceral hump and covered with papillae. Dorsal base color is dark brown or dark gray, sometimes nearly uniformly so, and sometimes yellowish-gray to cream with numerous irregular dark markings; head coloration is dark brown or dark gray. The pneumostome is posterior to the midline of the mantle on the right side. The foot is narrow, with a median groove and tail pore near the posterior end, but lacking a dorsal keel. The sides of the foot with a uniform series of prominent oblique grooves, the sole is undivided (not tripartite); the mucous typically is clear.

**Internal Anatomy:** Vanatta 1914; Pilsbry 1948.

**Distribution:** Restricted to northwestern Montana west of the Continental Divide along the Bitterroot Mountains south of the Clark Fork River and the adjacent border region of northern Idaho. In Montana, 24 records in three counties: Mineral (3), Missoula (1), Ravalli (20). Elevation range is 1157 to 2283 m (3795 to 7490 ft).

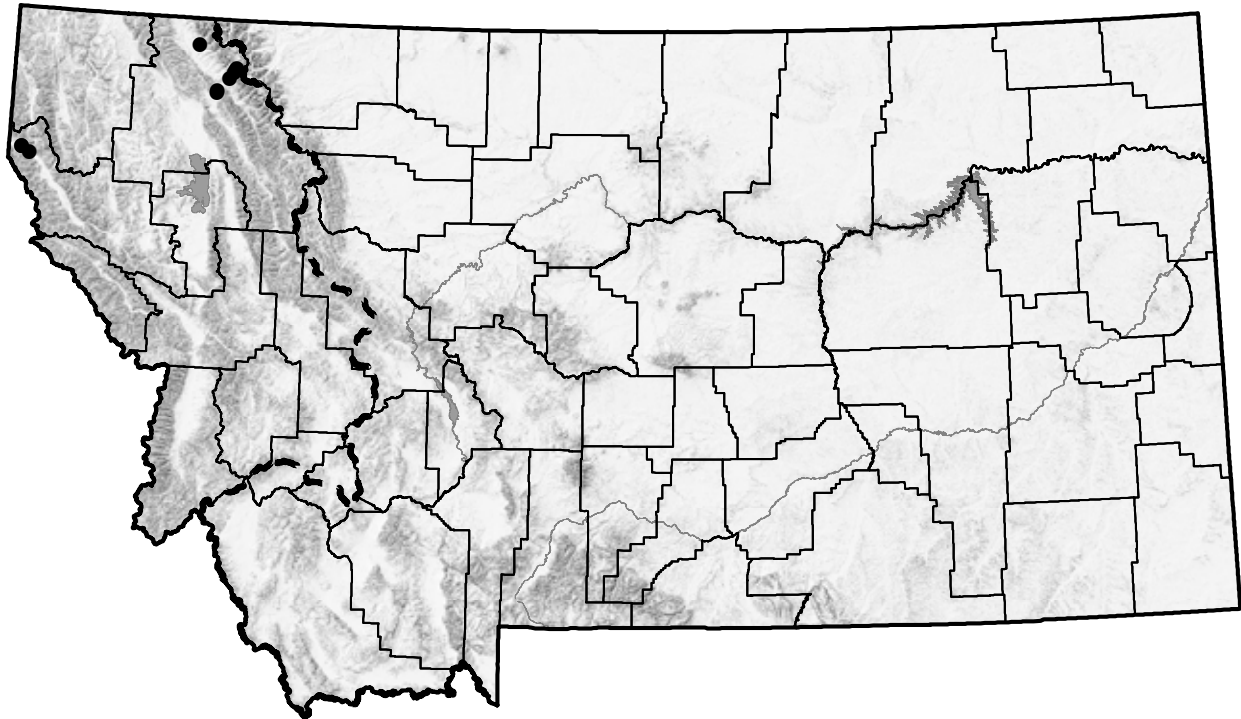
**Habitat:** Mostly in mesic mixed conifer forest, typically near water such as stream-side riparian areas and seeps. Canopy species include Engelmann spruce, subalpine fir, western redcedar, western hemlock, grand fir, Douglas-fir, alder, aspen, and black cottonwood. Usually found under woody debris and leaf litter or in downed rotten logs, sometimes under rocks.

**Conservation Status:** Montana Species of Concern (G2G3 S1S2)

**Remarks:** The original description was based on specimens discovered in 1912 at several locations in the Bitterroot Mountains, Ravalli County. Sometimes responds to disturbance by thrashing the foot side to side and flipping themselves. Up to seven individuals were found at one Ravalli County site in late September. Animals found in the wild as juveniles have lived more than 16 months in captivity. It has been reported three times in the stomachs of terrestrial gartersnakes (*Thamnophis elegans*).

**Selected References:** Hendricks et al. 2007, 2008; Pilsbry 1948; Vanatta 1914.

***Prophysaon andersoni* - Reticulate Taildropper**



*Photo by MTNHP*

***Prophysaon andersoni* (J. G. Cooper, 1872)    Reticulate Taildropper**

**Synonyms:** *Arion andersonii*, *Prophysaon hemphilli*, *P. pacificum*, *P. flavum*.

**Subspecies:** None.

**Description:** A moderately large slug of about 50 mm extended, but may reach 60 mm or slightly larger. Dorsal base color varies from dark grayish-brown to reddish-brown or yellowish, a diamond-mesh furrow pattern on the foot, sometimes highlighted with dark pigment. The mantle is 1/3 to 2/5 the body length, is sometimes distinctly paler, and appears granular, with a pair of dark lateral bands. Head color similar to foot, but tentacles often darker. The pneumostome is near the middle of the mantle in the anterior half, and on the right side. The tail is not keeled, although there may be a lighter mid-dorsal stripe in some individuals. The sole is undivided (not tripartite) and pale, with a line of abscission near the posterior quarter (sometimes distinct only under magnification); the mucous is yellow to orange, especially in disturbed animals.

**Internal Anatomy:** Forsyth 2004; Pilsbry 1948.

**Distribution:** Pacific coastal region from Alaska to California; disjunct populations in northern Idaho and adjacent northwestern Montana west of the Continental Divide. In Montana, 10 records in two counties: Flathead (7), Sanders (3). Elevation range is 674 to 1239 m (2210 to 4065 ft).

**Habitat:** Mostly in mesic mixed conifer forest, often relatively close to water. Canopy species include western redcedar, western hemlock, grand fir, Douglas-fir, black cottonwood, paper birch, aspen, Engelmann spruce, western larch, western white pine, and lodgepole pine, with secondary canopy sometimes including alder, Pacific yew and mountain ash. Usually found under woody debris and leaf litter or in downed rotten wood, sometimes under rocks.

**Conservation Status:** Montana Species of Concern (G5 S1S2).

**Remarks:** As the common name indicates, taildroppers have a line of abscission where the tail (end of the foot) can be dropped (autotomized), much as in lizards, as a defense against predator attack. Older reports of this species in northern Idaho are questioned by some authorities, but its presence in adjacent Montana indicates the records from Idaho are probably valid. First recorded from Montana in 2005. Up to 14 individuals were found at one Sanders County site in mid-October.

**Selected References:** Forsyth 2004; Frest and Johannes 2001; Grimm et al. 2009; Hendricks 2009; Hendricks et al. 2006, 2007; Pilsbry 1948; Smith 1943.



*Prophysaon humile* - Smoky Taildropper

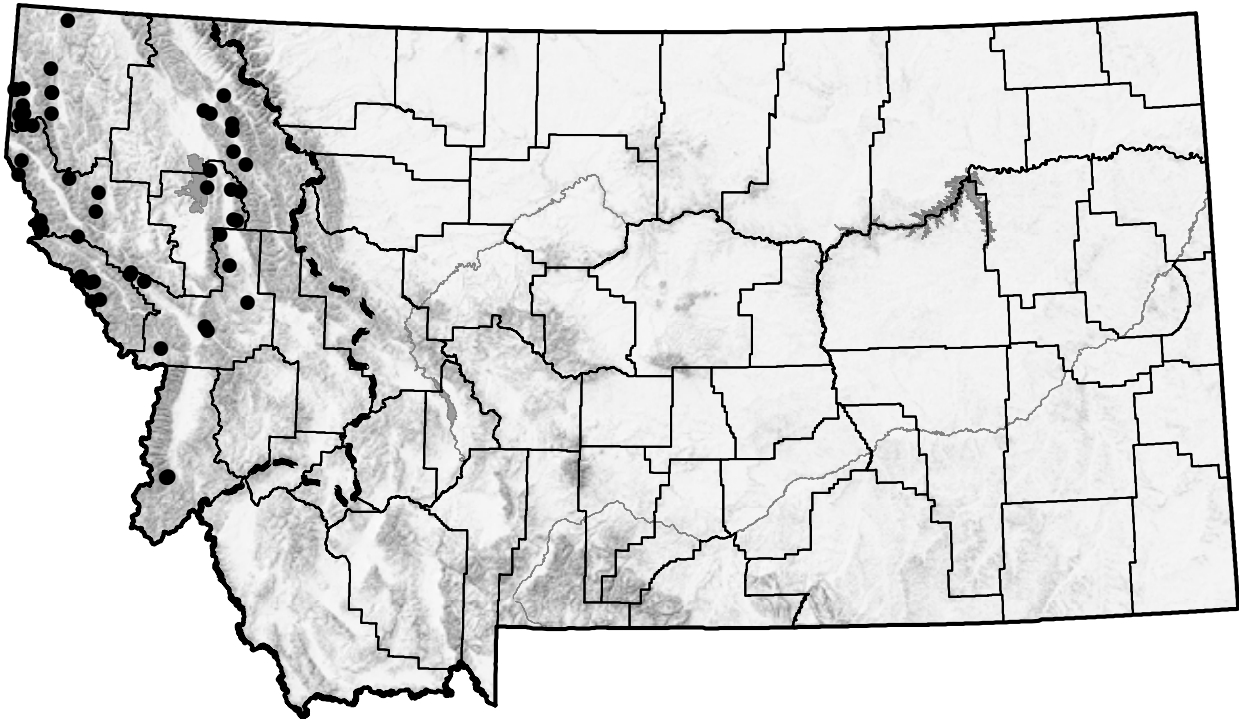


Photo by MTNHP

***Prophysaon humile* Cockerell, 1890    Smoky Taildropper**

**Synonyms:** None.

**Subspecies:** None.

**Description:** A moderately large slug of about 50 mm extended, but may reach 70 mm or slightly larger. Dorsal base color pale orange or reddish-yellow to tan, the foot with a series of oblique furrows and reticulations sometimes highlighted with dark pigment. The mantle is 1/3 to 2/5 the body length, sometimes distinctly paler than the foot and with a granular appearance, with a pair of dark lateral stripes that meet along the posterior margin, mantle sometimes also with several indistinct grayish splotches. Head color is like the mantle, the tentacles darker. The pneumostome is near the middle of the mantle in the anterior half, and on the right side. There is a lighter-colored broad mid-dorsal band on the tail bounded by a pair of wide gray to dark brown bands reaching to the tip of the tail and appearing somewhat as extensions of the mantle stripes; the tail is not keeled. The sole is undivided (not tripartite) and pale, with a line of abscission near the posterior fifth of the foot (sometimes distinct only under magnification); the mucous is yellow to orange, especially in disturbed animals.

**Internal Anatomy:** Pilsbry 1948.

**Distribution:** Northern Idaho and adjacent northwestern Montana west of the Continental Divide. In Montana, 54 records in seven counties: Flathead (7), Lake (5), Lincoln (15), Mineral (6), Missoula (8), Ravalli (3), Sanders (10). Elevation range is 675 to 1717 m (2215 to 5633 ft).

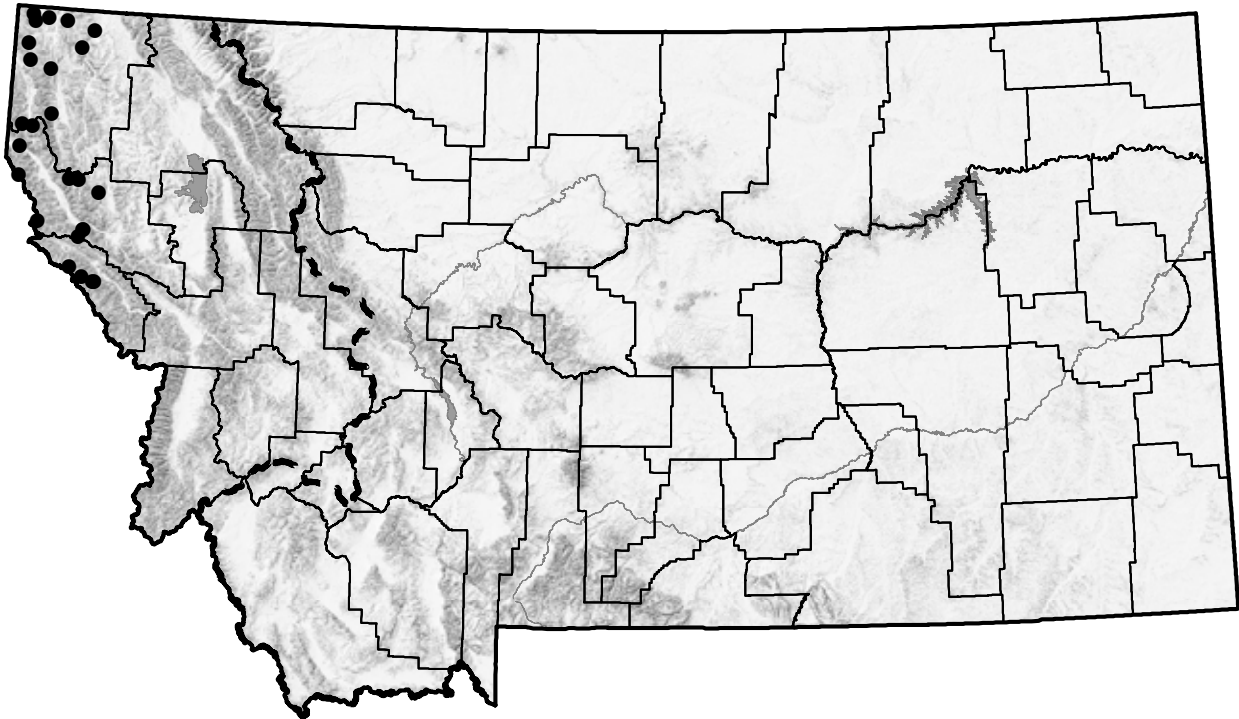
**Habitat:** Mostly in mesic mixed conifer forest, often relatively close to water. Canopy species include western redcedar, western hemlock, grand fir, Douglas-fir, Engelmann spruce, subalpine fir, ponderosa pine, black cottonwood, paper birch, aspen, western larch, and lodgepole pine, with secondary canopy sometimes including alder, dogwood, willow, Pacific yew, and hawthorn. Usually found under woody debris and leaf litter or in downed rotten wood, sometimes under rocks.

**Conservation Status:** Montana Species of Concern (G3 S2S3).

**Remarks:** The original description was based on animals from near Coeur d'Alene Lake, Kootenai County, Idaho. As the common name indicates, taildroppers have a line of abscission where the tail (end of the foot) can be dropped (autotomized), much as in lizards, as a defense against predator attack. Small individuals sometimes drop their tails while being held in-hand, and the dropped tails may continue to wiggle for over an hour. Up to 16 individuals were found at one Lincoln County site in mid-October. There is only one (unpublished) record of this species from Montana prior to 2004.

**Selected References:** Cockerell 1890, Deyrup-Olsen et al. 1986, Frest and Johannes 1995, 2001; Hendricks et al. 2006, 2007; Pilsbry 1948.

*Kootenaia burkei* - Pygmy Slug



*Photo by MTNHP*



***Kootenaia burkei* Leonard, Chichester, Baugh, Wilke, 2003    Pygmy Slug**

**Synonyms:** None.

**Subspecies:** None.

**Description:** A small slug, extended adults usually < 15 mm. Dorsal base color is light gray or tan, with pale blue flecking to varying density. Mantle is oval with irregular dark gray to brown spots, the head extending a short distance beyond the anterior margin. The tail is rounded dorsally, lacks a mid-dorsal keel, but sports a series of shallow, parallel longitudinal and oblique grooves that appear as darker lines; lacking a line of abscission, present in the taildroppers (*Prophysaon*). The sole is undivided (not tripartite), mucous clear. The pneumostome is slightly posterior to the midline of the mantle on the right side.

**Internal Anatomy:** Leonard et al. 2003.

**Distribution:** Southeastern British Columbia, northern Idaho and adjacent northwestern Montana west of the Continental Divide. In Montana, 25 records in three counties: Lincoln (11), Mineral (4), Sanders (10). Elevation range is 668 to 1508 m (2190 to 4948 ft).

**Habitat:** Mostly mesic mixed conifer forest and riparian woodlands, but typically moister than for some other slug species. Canopy species often include western redcedar, western hemlock, grand fir, Engelmann spruce, Douglas-fir, black cottonwood, paper birch, sometimes subalpine fir, western white pine, western larch, ponderosa pine, and lodgepole pine; secondary canopy includes alder, dogwood and western yew. Usually found relatively near perennial streams and seeps under woody debris, rocks, on moss mats, within leaf litter, sometimes within rotten logs.

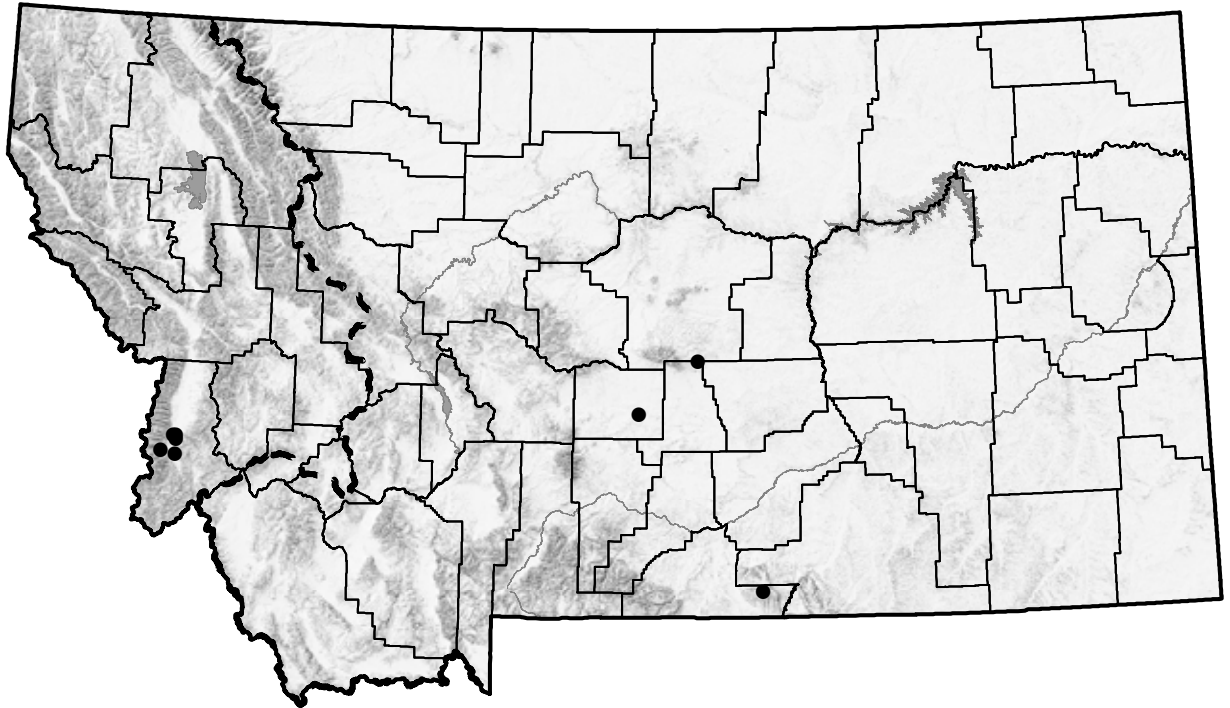
**Conservation Status:** Montana Species of Concern (G2 S1S2).

**Remarks:** Described as a new genus and species in 2003 based on animals collected at five northern Idaho sites during 2001-2003, first reported in Montana in 2005. May be locally abundant; 26 individuals were found at one Lincoln County site in early October. A captive individual laid eggs in mid-July that were near to hatching by mid September.

**Selected References:** Grimm et al. 2009; Hendricks et al. 2006, 2007, 2008; Leonard et al. 2003.

## SPECIES ACCOUNTS - SNAILS

### *Catinella rehderi* - Chrome Ambersnail



*Image not available*

***Catinella rehderi* (Pilsbry, 1948) Chrome Ambersnail**

**Synonyms:** *Quickella rehderi*, *Succinea oregonensis* (in part).

**Subspecies:** None.

**Description:** Shell is oblong-ovate (succineiform), to about 12 mm in length and 8 mm in width, surface with irregular low wrinkles, about 3 1/4 whorls. Shell coloration is glossy, deep chrome yellow, somewhat opaque and chalky. Aperture is oblique and broadly oval, about 3/5 the shell length. Head and tentacles brownish

**Internal Anatomy:** Pilsbry 1948.

**Distribution:** Native to western North America, from Washington to southern California, east to Montana. In Montana, reported on both sides of the Continental Divide from four counties: Carbon, Fergus, Ravalli, Wheatland. Elevation range is 1219 to 1829 m (4000 to 6000 ft).

**Habitat:** Riparian areas, near rivers, streams, and springs. Canopy species include cottonwoods. Found under woody debris and leaf litter in moist places.

**Conservation Status:** No special status in Montana (G3Q SNR).

**Remarks:** Range, abundance, and habitat poorly defined in Montana; current status needs investigation.

**Selected References:** Berry 1916; Forsyth 2004; Frest and Johannes 2001; Pilsbry 1948; Vanatta 1914.

*Catinella vermeta* - Suboval Ambersnail

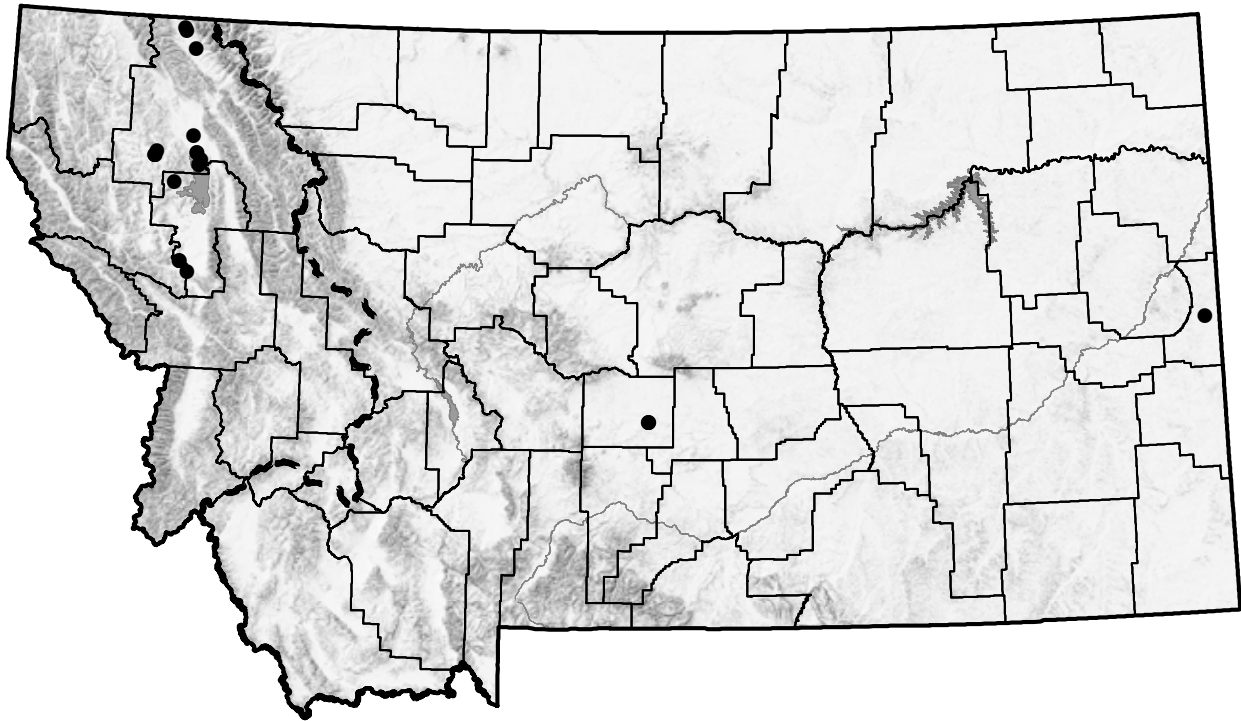


Photo by MTNHP

***Catinella vermeta* (Say, 1829) Suboval Ambersnail**

**Synonyms:** *Succinea avara*, *Catinella avara*.

**Subspecies:** None.

**Description:** Shell is oblong-ovate (succineiform), to about 13 mm in length and 7 mm in width, surface irregularly wrinkled, to about 3 whorls. Shell coloration is translucent, pale yellowish to whitish. Aperture is ovate, about 3/5 to 2/3 the shell length. Head and body are grayish, tentacles blackish.

**Internal Anatomy:** Pilsbry 1948.

**Distribution:** Native and widespread across North America, south to northern Mexico. In Montana, reported on both sides of the Continental Divide from four counties: Flathead, Lake, Wheatland, Wibaux. Elevation range is 814 to 1250 m (2670 to 4100 ft).

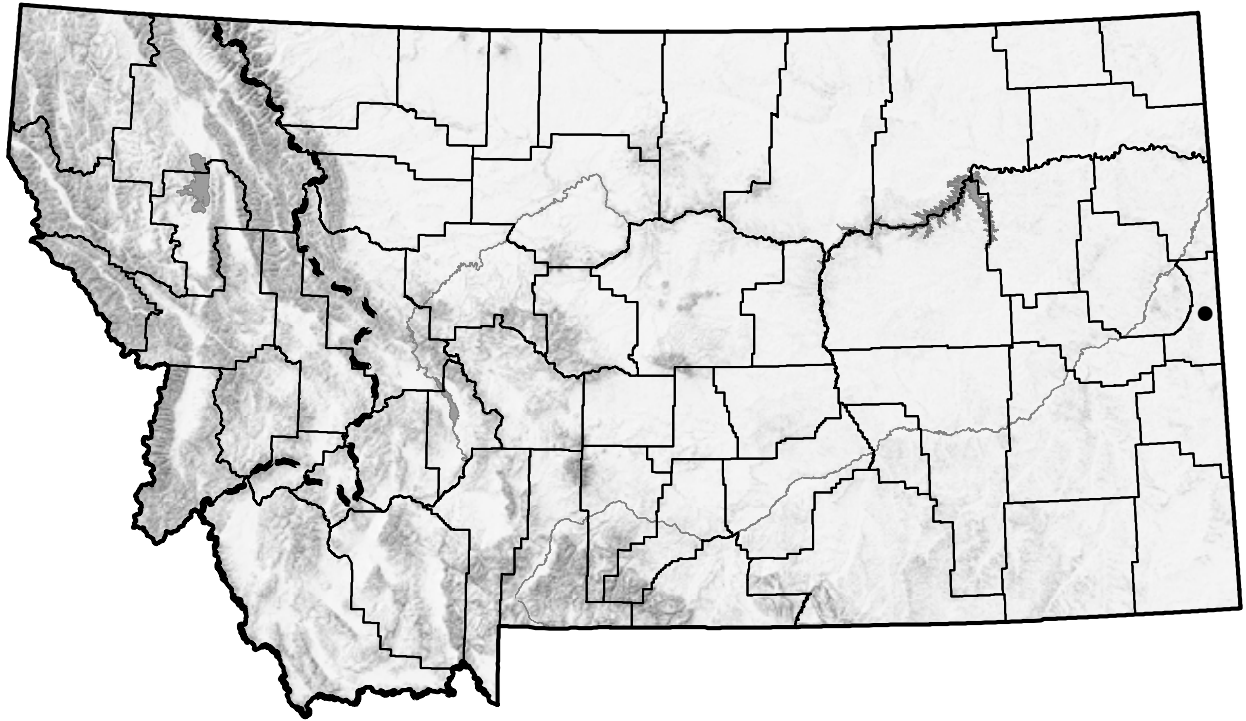
**Habitat:** Riparian areas, near rivers, streams, springs, and ephemeral wetland pockets, also drier sites away from water. Canopy species include aspen, Engelmann spruce, cottonwood, dogwood and willow. Found under woody debris and leaf litter in moist places, also under rock, in talus, and at the base of shrubs.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Range, abundance, and habitat poorly defined in Montana; current status needs investigation.

**Selected References:** Beetle 1989; Berry 1913, 1916; Forsyth 2004; Frest and Johannes 2001; Hendricks 2009; Pilsbry 1948; Russell and Brunson 1967; Squyer 1894.

*Oxyloma gouldi* - An Ambersnail



*Oxyloma* sp. photo by David Cappaert, Mich. St. Univ., Bugwood.org

***Oxyloma gouldi* (Pilsbry, 1948) No Common Name**

**Synonyms:** *Succinea ovalis*, *Oxyloma decampi gouldi*.

**Subspecies:** None.

**Description:** Shell oblong-ovate (succineiform), to 15 mm in length and 7.5 mm in width, very thin, surface with minute striae, about 3 whorls with a short spire. Shell coloration is translucent, pale yellow. Aperture is ovate, long and relatively thin, about 3/4 the shell length. Head and neck covered with minute black dots.

**Internal Anatomy:** Pilsbry 1948.

**Distribution:** Native to eastern North America. In Montana, reported east of the Continental Divide only from Wibaux County. Elevation at this location is 823 m (2700 ft).

**Habitat:** Prairie riparian areas, near rivers, streams, and springs. Canopy species include cottonwoods. Found under woody debris and leaf litter in moist places.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Range, abundance, and habitat poorly defined in Montana; current status needs investigation.

**Selected References:** Harris and Hubricht 1982; Pilsbry 1948; Squyer 1894.

*Oxyloma haydeni* - Niobrara Ambersnail

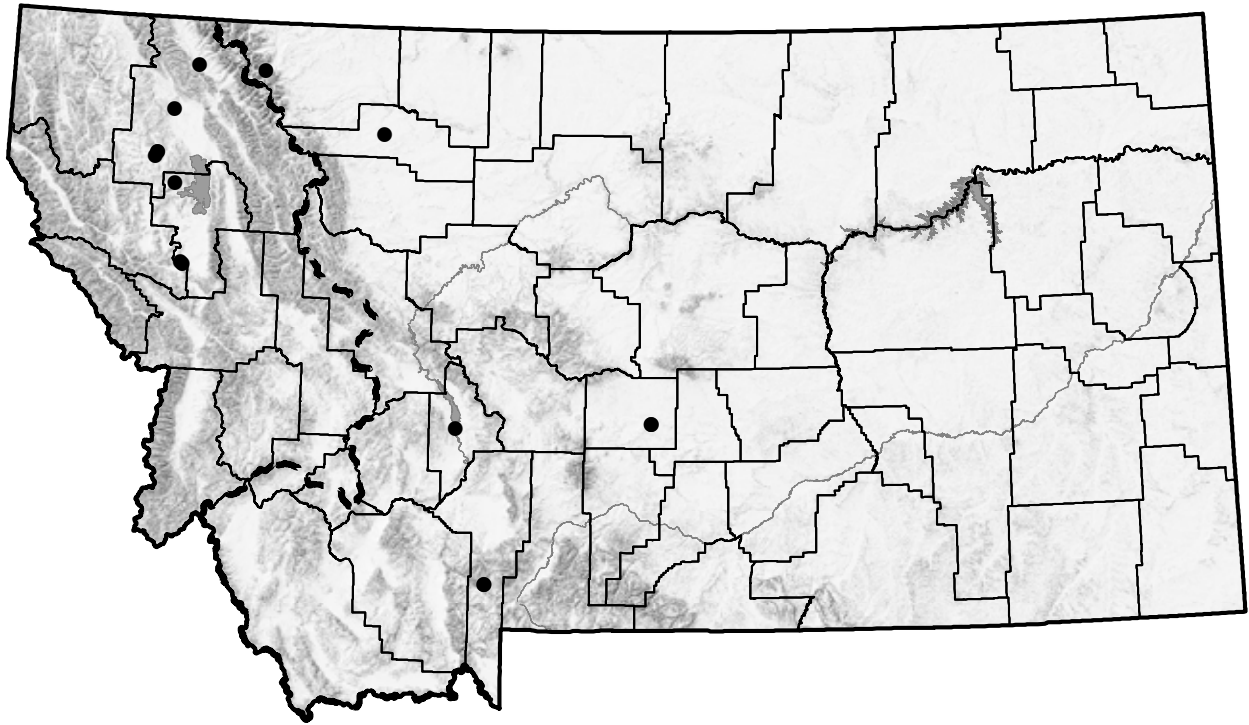


Photo by Roy Averill-Murray



***Oxyloma haydeni* (Binney, 1858) Niobrara Ambersnail**

**Synonyms:** probably *Oxyloma retusum* (= *O. retusa* in part: old western records), *Succinea haydeni*.

**Subspecies:** None.

**Description:** Shell is oblong-ovate (succineiform), to about 21 mm in length and 9 mm in width, thin, with irregular wrinkles and spiral furrows, about 3 whorls with a short spire. Shell coloration glossy amber. Aperture is oblique, ovate, and somewhat narrow, 2/3 to 3/4 the shell length.

**Internal Anatomy:** Not described.

**Distribution:** Native to North America; prairies and prairie parklands from Alberta to Manitoba south to Nebraska. In Montana, reported on both sides of the Continental Divide from seven counties: Broadwater, Flathead, Gallatin, Glacier, Lake, Pondera, Wheatland. Elevation range is 814 to 1902 m (2670 to 6240 ft).

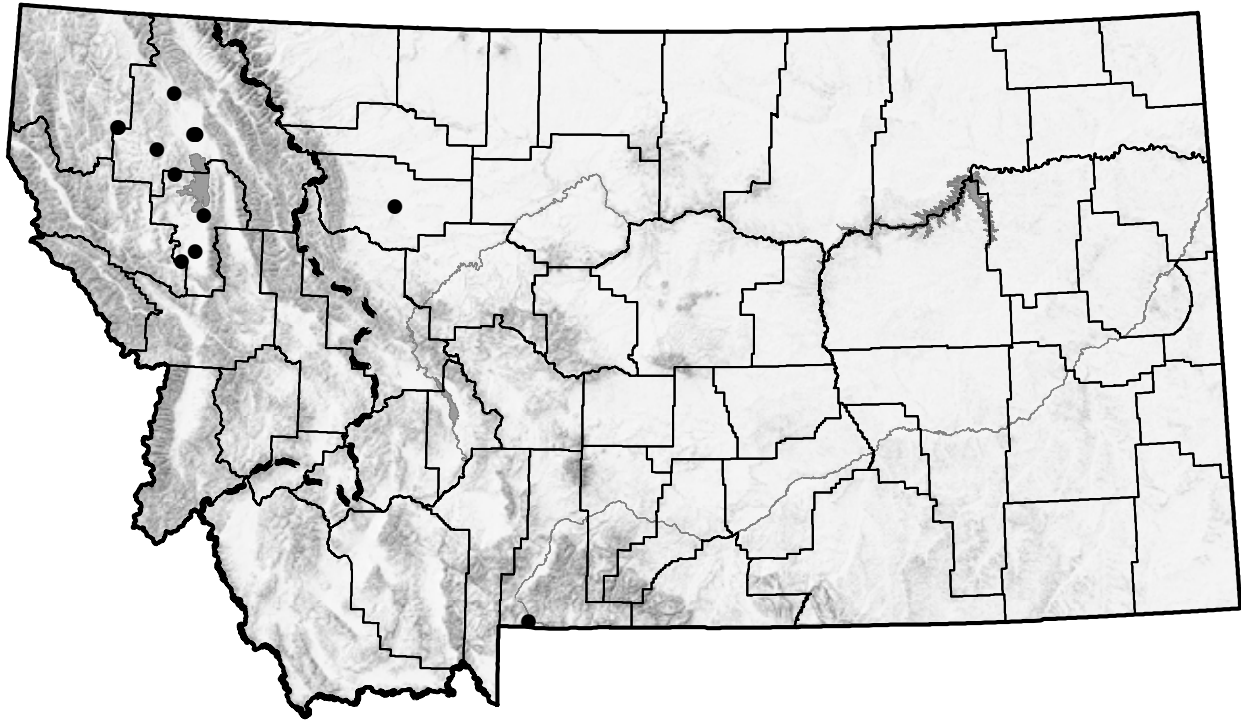
**Habitat:** Prairie riparian areas, near rivers, streams, and springs. Canopy species include cottonwoods. Found under woody debris and leaf litter in moist places.

**Conservation Status:** No special status in Montana (G3 SNR).

**Remarks:** Montana reports of *O. retusa* east of the Continental Divide are possibly *O. haydeni*. Reports of *O. haydeni* west of the Continental Divide possibly should be assigned to *O. missoula* or some other *Oxyloma* species. *O. retusum* (= *retusa*) is now considered a species of eastern North America, whereas *O. haydeni* is the most common species of the prairie parklands east of the Rocky Mountains. Range, abundance, and habitat poorly defined in Montana; current status needs investigation.

**Selected References:** Beetle 1989, 1997; Berry 1913, 1916; Harris and Hubricht 1982; Pilsbry 1948.

***Oxyloma missoula* - Ninepipes Ambersnail**



*Oxyloma* sp. photo by David Cappaert, Mich. St. Univ., Bugwood.org

***Oxyloma missoula* Hubricht, 1982   Ninepipes Ambersnail**

**Synonyms:** probably *Oxyloma retusum* (= *O. retusa* in part: old western records).

**Subspecies:** None.

**Description:** Shell is oblong-ovate (succineiform), very thin and fragile, about 14.5 mm in length and 7.5 mm in width, with 3 whorls, the spire about 1/3 the length of the shell. Shell coloration is pale amber. Aperture is oblique and ovate, with a thin lip. The head and tentacles are grayish-brown, mantle with dark gray spots and streaks

**Internal Anatomy:** Harris and Hubricht 1982 (described, not illustrated).

**Distribution:** Native to western North America in Montana and Utah. In Montana, reported on both sides of the Continental Divide from five counties: Beaverhead, Lake, Lewis and Clark, Lincoln, Teton. Elevation range is about 853 to 1494 m (2800 to 4900 ft).

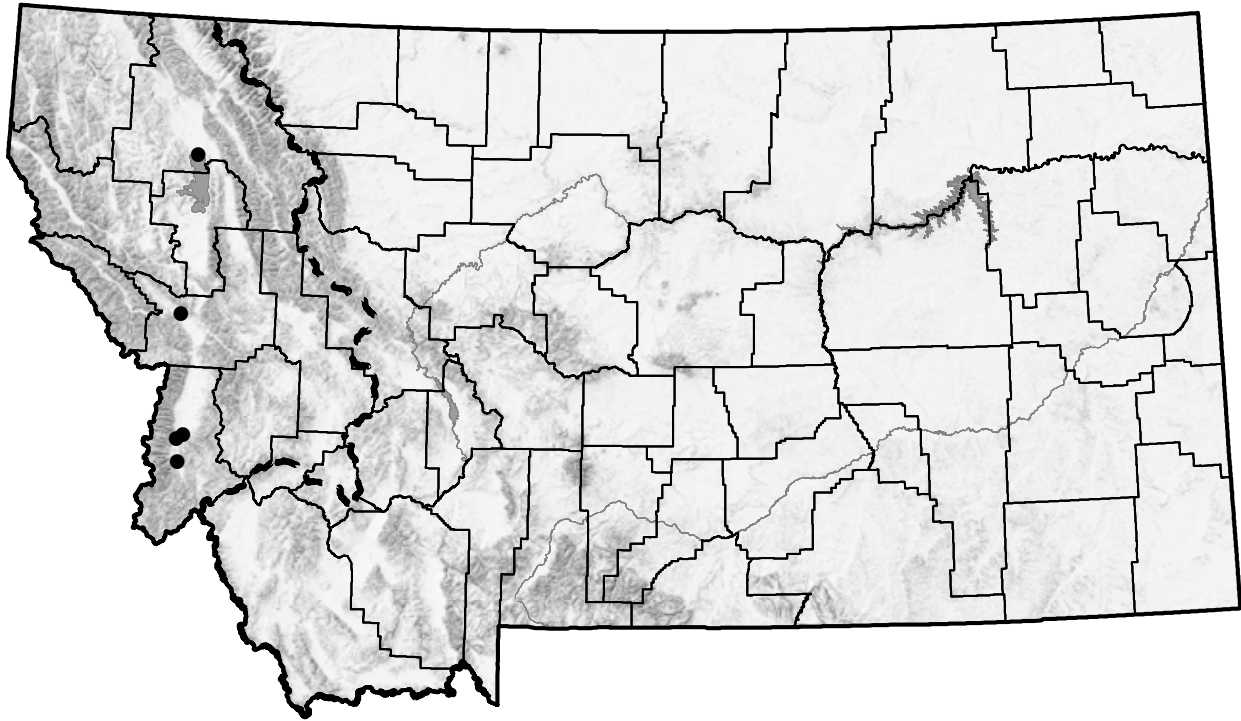
**Habitat:** Wetlands, lakeshore areas, stream sides.

**Conservation Status:** No special status in Montana (G2G4 SNR).

**Remarks:** The original description was based on animals collected at Ninepipes National Wildlife Refuge, Lake County. Specimens previously identified in Montana (from Flathead, Lake, Lincoln, and Park counties) as *Oxyloma retusum* (= *retusa*) are probably this species. Its shells are similar but *O. retusum* is restricted to eastern North America. Montana locations for *O. haydeni* west of the Continental Divide probably should be transferred to *O. missoula*. Range, abundance, and habitat poorly defined in Montana; current status needs investigation.

**Selected References:** Harris and Hubricht 1982.

***Oxyloma nuttallianum* - Oblique Ambersnail**



*Photo by Bill Leonard taken from the collection of TE Burke.*

***Oxyloma nuttallianum* (I. Lea, 1841) Oblique Ambersnail**

**Synonyms:** *Succinea nuttalliana*, *S. rusticana*.

**Subspecies:** None.

**Description:** Shell is oblong-ovate (succineiform), to about 17 mm in length and 9 mm in width, thin, about 3 whorls with a short spire. Shell coloration is transparent, pale yellow. Aperture is oblique, ovate, elongate, about 3/4 the shell length. Head and foot covered with minute black dots patterned somewhat in spots or stripes.

**Internal Anatomy:** Pilsbry 1948.

**Distribution:** Native to western North America, from British Columbia to northern Baja California, Mexico, east to Montana. In Montana, reported west of the Continental Divide from three counties: Flathead, Missoula, Ravalli. Elevation range is 884 to 1219 m (2900 to 4000 ft).

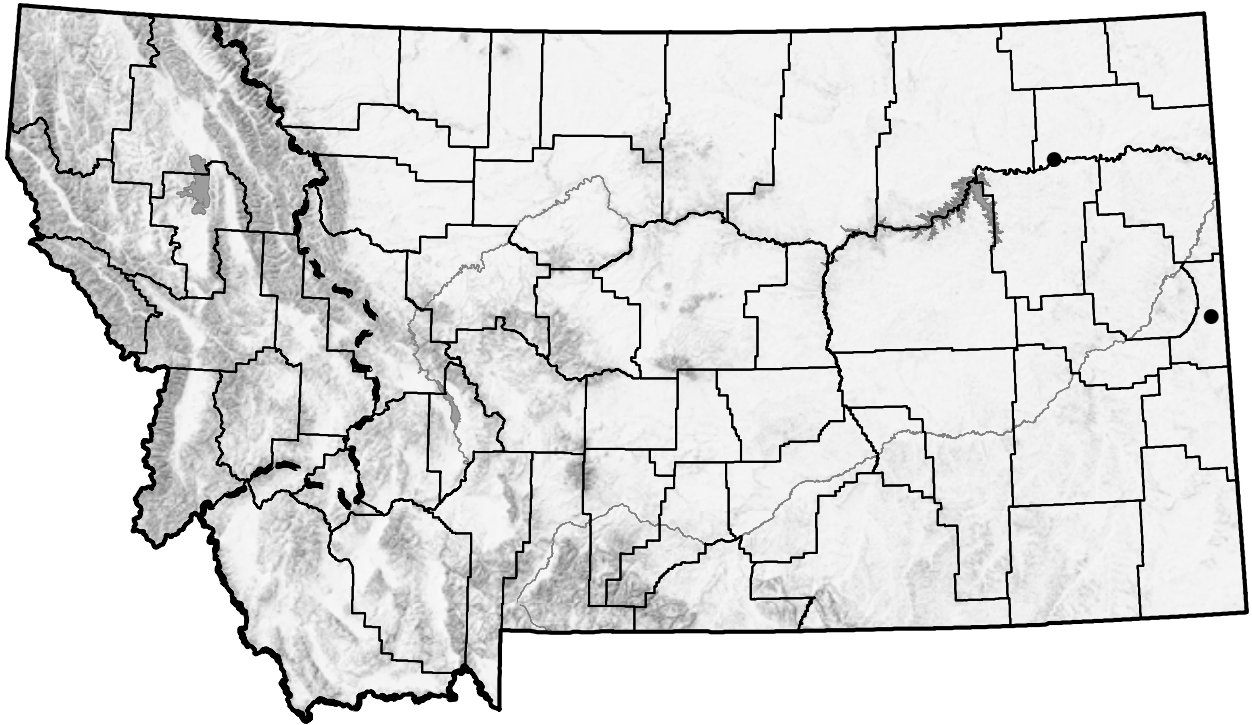
**Habitat:** Riparian areas near rivers, streams, lake shores, bogs and springs.

**Conservation Status:** No special status in Montana (G2G4 SNR).

**Remarks:** Range, abundance, and habitat poorly defined in Montana; current status needs investigation. All records of *O. retusum* (= *retusa*) west of the Continental Divide (from Flathead, Lake, and Lincoln counties) may be this species or *O. missoula*; *O. retusum* is considered an eastern North American species.

**Selected References:** Elrod 1901a; Forsyth 2004; Frest and Johannes 2001; Henderson 1924, 1936; Pilsbry 1948; Vanatta 1914.

***Succinea grosvenori* - Santa Rita Ambersnail**



*Succinea* sp. Photo by Gary Rosenberg

***Succinea grosvenori* I. Lea, 1864   Santa Rita Ambersnail**

**Synonyms:** *Succinea lineata*, *S. mooresiana*.

**Subspecies:** None.

**Description:** Shell is oblong-ovate (succineiform), to about 15 mm in length and 9 mm diameter, thin, surface with numerous fine striae, about 3 1/2 to 4 whorls with a short spire. Shell coloration is translucent to opaque pale yellowish to whitish. Aperture is oblique and ovate, somewhat inflated, about 3/5 the shell length.

**Internal Anatomy:** Pilsbry 1948.

**Distribution:** Eastern North America west to the Rocky Mountains, including Utah and Arizona. In Montana, reported east of the Continental Divide from two counties: Roosevelt, Wibaux. Elevation range is 610 to 823 m (2000 to 2700 ft).

**Habitat:** Prairie riparian wetlands, near rivers, streams, seeps, sometimes drier habitat with sparse vegetation but where ground remains damp.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Range, abundance, and habitat poorly defined in Montana; current status needs investigation.

**Selected References:** Beetle 1989; Pilsbry 1948; Squyer 1894.



*Cochlicopa lubrica* - Glossy Pillar

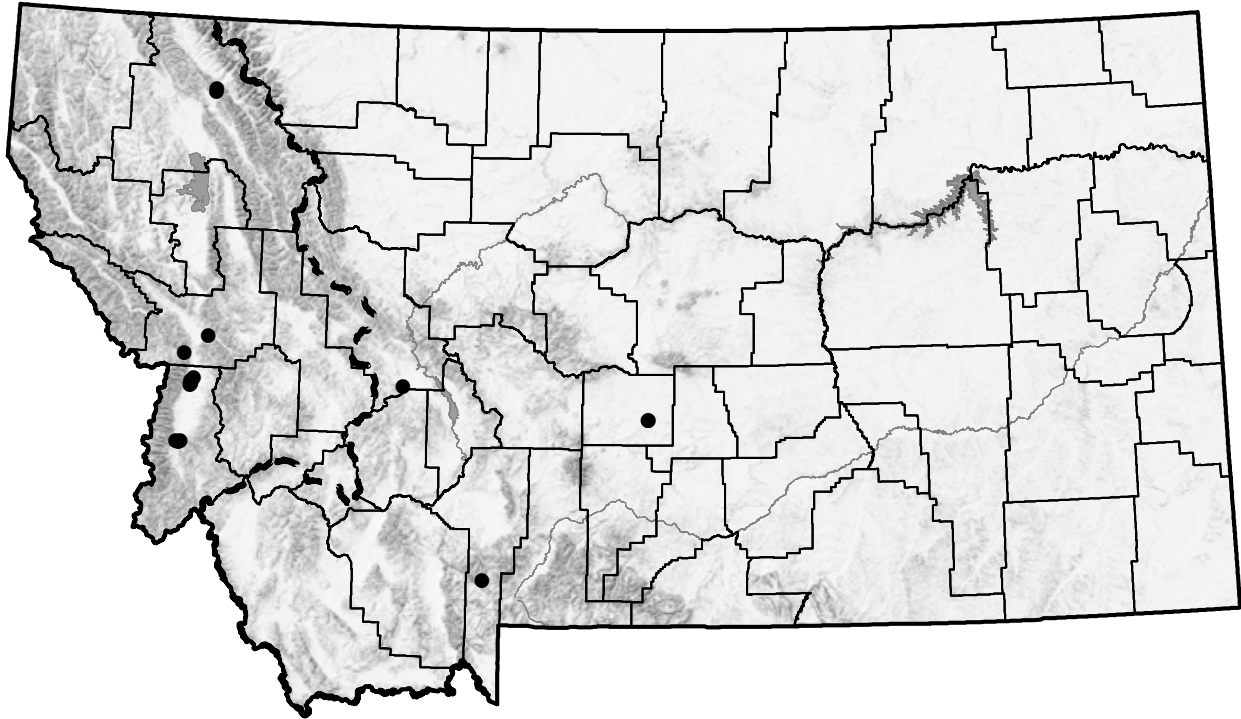


Photo by MTNHP

***Cochlicopa lubrica* (Müller, 1774) Glossy Pillar**

**Synonyms:** *Cionella lubrica*, *Helix lubrica*.

**Subspecies:** None.

**Description:** A small shell, to about 2.5 mm diameter and 6.5 mm in height, spindle-shaped (pupiform) with a long and smooth spire bluntly-rounded at the apex, about 5 to 7 whorls. Shell coloration is translucent light brown to amber, and glossy. Aperture taller than wide, ovate and sub-vertical, lip thickened within by an opaque rib and lacks teeth (denticles); periphery rounded; umbilicus absent. Animal is darkish gray, paler on the sides.

**Internal Anatomy:** Outeiro et al. 1990; Pilsbry 1948.

**Distribution:** Throughout Europe, northern Asia and Africa, and North America to Mexico. In Montana, reported on both sides of the Continental Divide from five counties: Flathead, Lewis and Clark, Missoula, Ravalli, Wheatland. Elevation range is 963 to 1341 m (3160 to 4400 ft).

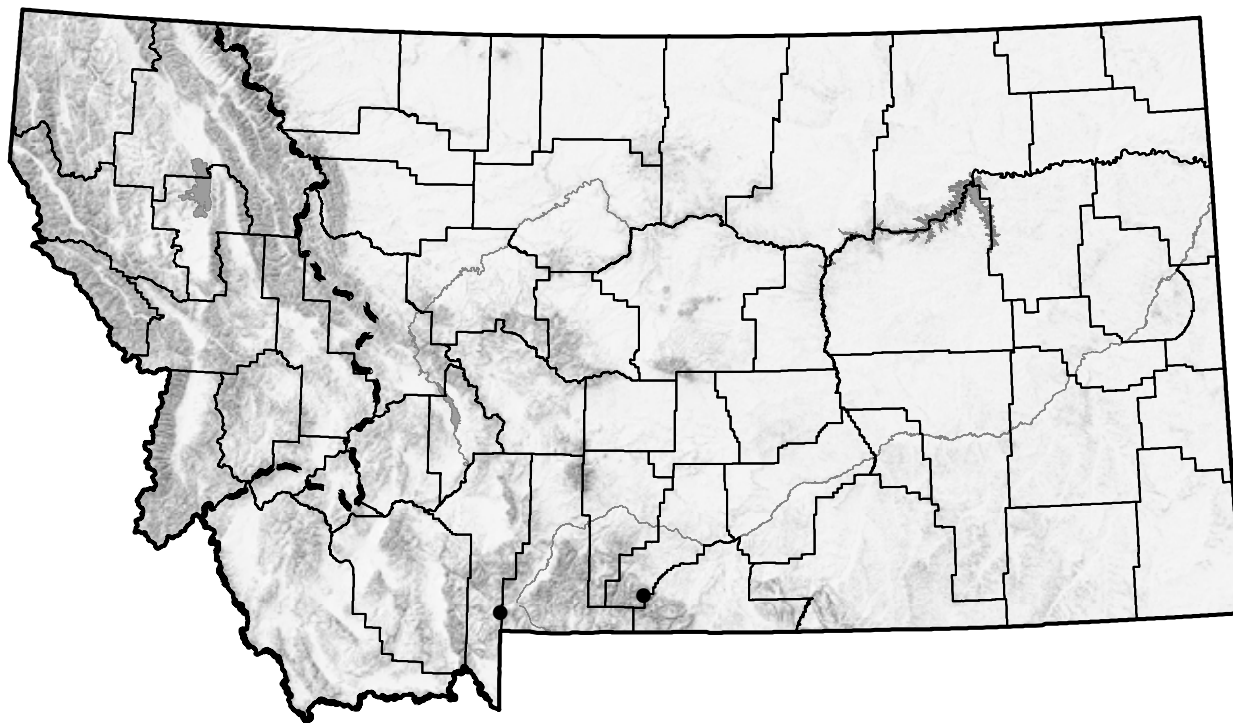
**Habitat:** Moist sites, often in disturbed areas such as gardens, residential areas, roadsides and pastures; not common in natural areas or dense forest. Canopy tree species include black cottonwood, aspen, scattered Engelmann spruce, ponderosa pine, secondary canopy species include willow and alder. Found under woody debris and in leaf litter or duff.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Range in Montana poorly defined. May be relatively common locally; 17 were found at one Ravalli County site in late June.

**Selected References:** Berry 1916; Forsyth 2004; Frest and Johannes 2001; Hendricks 2009; Pilsbry 1948; Smith 1943; Vanatta 1914.

*Zoogenetes harpa* - Boreal Top



*Photo by MTNHP*

***Zoogenetes harpa* (Say, 1824)    Boreal Top**

**Synonyms:** *Helix harpa*, *Acanthinula harpa*.

**Subspecies:** None.

**Description:** A small shell taller than wide, to 2.5 mm diameter and 3.3 mm in height, conic-ovate, about 4 whorls. The shell is somewhat transparent, grayish-green (live animals may appear darker) and somewhat glossy, with widely spaced lamellar axial ribs and finer incremental striae. Aperture is ovate and oblique, lacking denticles (teeth), lip is not expanded, periphery rounded; the umbilicus is very narrow. Head and foot are gray, tentacles darker, mantle dark gray with lighter spotting.

**Internal Anatomy:** Pilsbry 1948.

**Distribution:** Circumboreal including the northern United States south to Colorado. In Montana, reported from Gallatin and Stillwater counties, both east of the Continental Divide near the border with Wyoming. Elevations of these sites are 2167 and 1945 m (7110 and 6380 ft), respectively.

**Habitat:** Moist sites near streams, including campgrounds. Canopy species include Engelmann spruce, subalpine fir and black cottonwood, secondary canopy includes alder. Found under woody debris, in leaf litter, or duff.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Produces living young rather than laying external eggs. First reported for Montana in 2006; range and habitat remain poorly defined. Only single live animals found at sites.

**Selected References:** Beetle 1961, 1989; Forsyth 2004; Henderson 1936; Hendricks et al. 2007; Pilsbry 1948.

*Vallonia cyclophorella* - Silky Vallonia

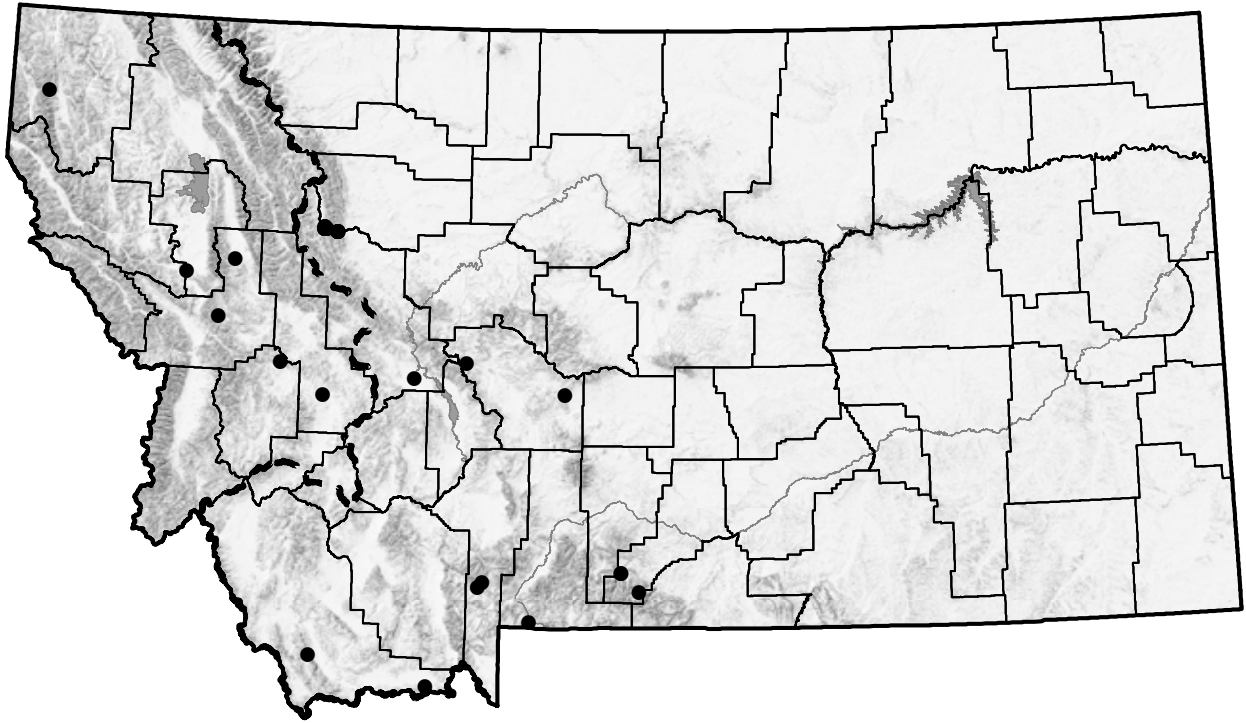


Photo by MTNHP

***Vallonia cyclophorella* Sterki , 1892   Silky Vallonia**

**Synonyms:** None.

**Subspecies:** None.

**Description:** A small shell, to 3.4 mm diameter and 1.4 mm in height, flattened heliciform with regularly spaced blade-like axial ribs, about 3 1/2 whorls, the last descending at the aperture. Shell coloration is translucent whitish, gray or pale brown. Aperture lip is abruptly flared but not thickened with an internal callus; umbilicus wide, about 1/2 to 1/3 the shell diameter. Animal is white.

**Internal Anatomy:** Not described.

**Distribution:** Western North America from Alaska to the southwestern United States, east to Alberta, North Dakota and Texas. In Montana, reported on both sides of the Continental Divide from 12 counties: Beaverhead, Gallatin, Granite, Lake, Lewis and Clark, Lincoln, Meagher, Missoula, Park, Powell, Stillwater, Teton. Elevation range is 1320 to 2300 m (4330 to 7545 ft).

**Habitat:** Drier mixed conifer forest and open grassy and rocky slopes. Canopy species include Douglas-fir, Engelmann spruce, western larch, lodgepole pine, black cottonwood, aspen, and Rocky Mountain juniper. Found under woody debris, rocks, and in leaf litter.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Similar in structure to *Vallonia perspectiva* but larger. May be locally common; 23 were found at one Teton County site in early August.

**Selected References:** Beetle 1961, 1997; Forsyth 2004; Frest and Johannes 2001; Henderson 1933; Pilsbry 1948.



*Vallonia gracilicosta* - Multirib Vallonia

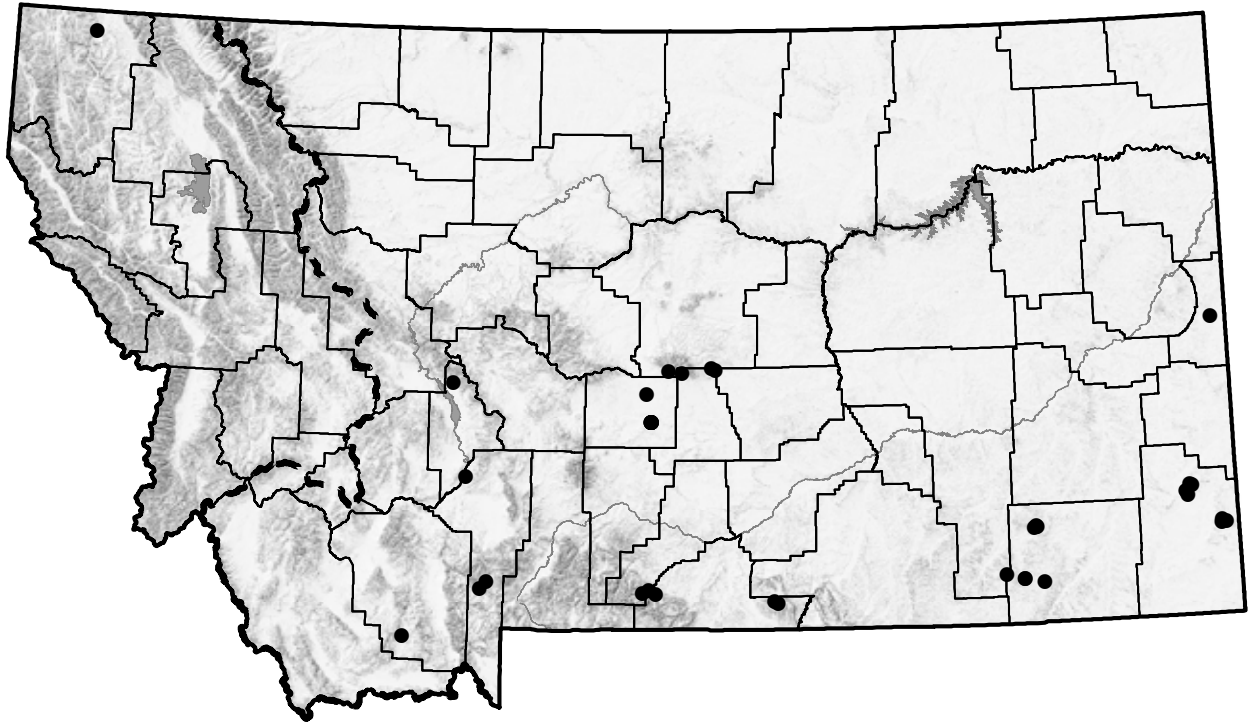


Photo by MTNHP



***Vallonia gracilicosta* Reinhardt, 1883   Multirib *Vallonia***

**Synonyms:** *Vallonia costata montana*, *V. albula*, *V. sonorana*.

**Subspecies:** None.

**Description:** A small shell, to about 2.9 mm diameter and 1.2 mm in height, flatten heliciform with widely-spaced lamellar axial ribs, about 3 to 3 1/2 whorls, the last strongly expanding and descending to the aperture. Shell coloration is translucent whitish to pale brown. Aperture lip thickened inside with a broad opaque-white rib; umbilicus wide, about 1/3 to 1/2 the shell diameter. Animal is white.

**Internal Anatomy:** Not described.

**Distribution:** North America south through the northern Midwest and Rocky Mountain states to Arizona and New Mexico. In Montana, reported on both sides of the Continental Divide (but mostly east) from 12 counties: Broadwater, Carbon, Carter, Fergus, Gallatin, Golden Valley, Lincoln, Madison, Powder River, Stillwater, Wheatland, Wibaux. Elevation range is 823 to 2149 m (2700 to 7050 ft).

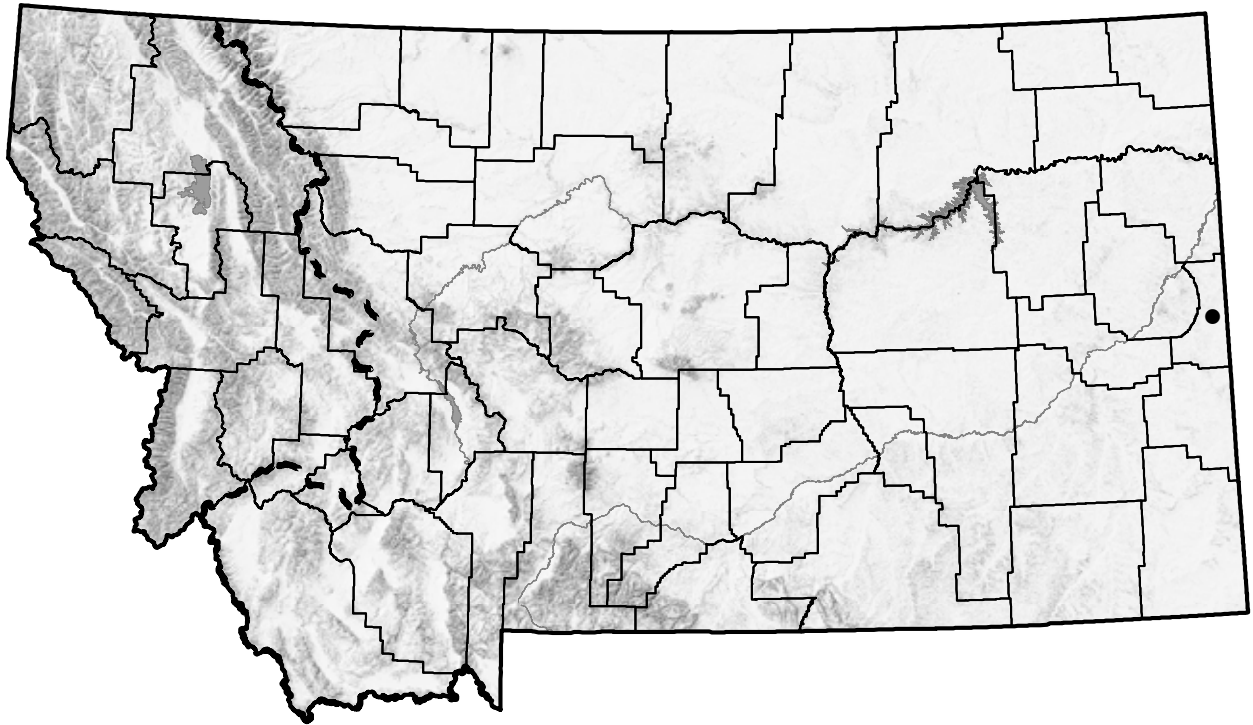
**Habitat:** Moist and drier forested sites, aspen stands. Canopy species include aspen, green ash, Douglas-fir, ponderosa pine, western larch, Engelmann spruce, western redcedar, subalpine fir, limber pine; secondary canopy includes dogwood, and hawthorn. Found under woody debris and rocks, in leaf litter and duff.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Reports of *Vallonia costata* by Berry are attributed by Henderson to this species. May be abundant in some sites; 64 shells (live and dead) were reported at one Fergus County site in early October.

**Selected References:** Beetle 1961, 1997; Berry 1913, 1916; Forsyth 2004; Henderson 1936; Pilsbry 1948; Squyer 1894.

*Vallonia perspectiva* - Thin-lip Vallonia



*Photo by David Kirsh*

***Vallonia perspectiva* Sterki, 1892 Thin-lipped Vallonia**

**Synonyms:** None.

**Subspecies:** None.

**Description:** A very small and thin shell, to about 2 mm diameter and 0.8 mm in height, flattened heliciform, with a series of evenly spaced ribs, to about 3 1/3 whorls, gradually increasing in size and flattened above and below the periphery, the last rapidly descending, suture deep. Shell coloration is translucent pale amber to colorless. Aperture is inclined, oblique-ovoid, without a thickened lip; umbilicus wide, about 1/2 the shell diameter. Animal is white.

**Internal Anatomy:** Not described.

**Distribution:** North America throughout the eastern and southwestern United States to Mexico. In Montana, reported east of the Continental Divide only from Wibaux County, elevation 823 m (2700 ft).

**Habitat:** Driers sites on hillsides, rocky outcrops, near springs, and streamside riparian habitat, including cottonwood and willow. Found under rocks and woody debris, in leaf litter, and drift material.

**Conservation Status:** No special status in Montana (G4G5 SNR).

**Remarks:** Identification questionable. The Wibaux County record was attributed by Henderson to *Vallonia parvula*, whereas Pilsbry made no mention of the Wibaux County record in his accounts of *V. perspectiva* or *V. parvula*. Similar to, but much smaller than, *V. cyclophorella*.

**Selected References:** Henderson 1924; Pilsbry 1948; Squyer 1894.

*Vallonia pulchella* - Lovely Vallonia

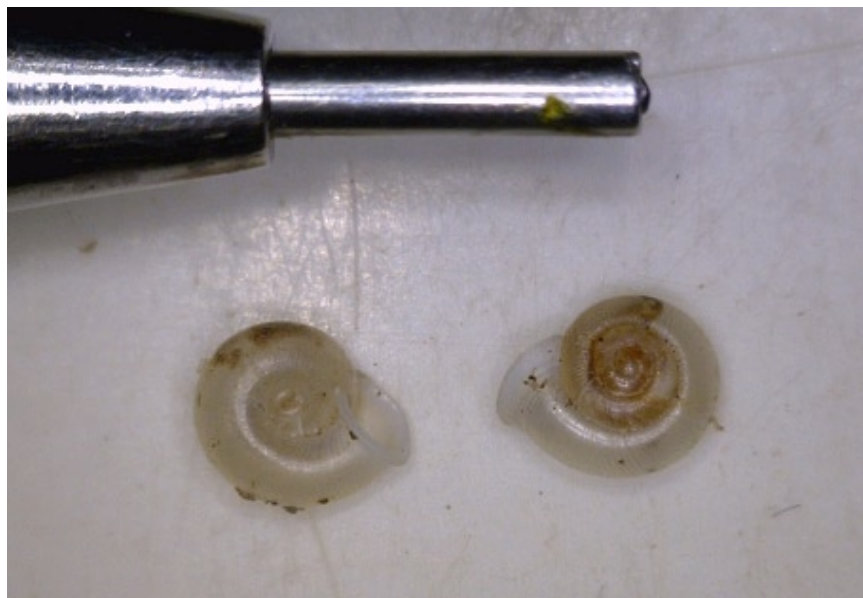
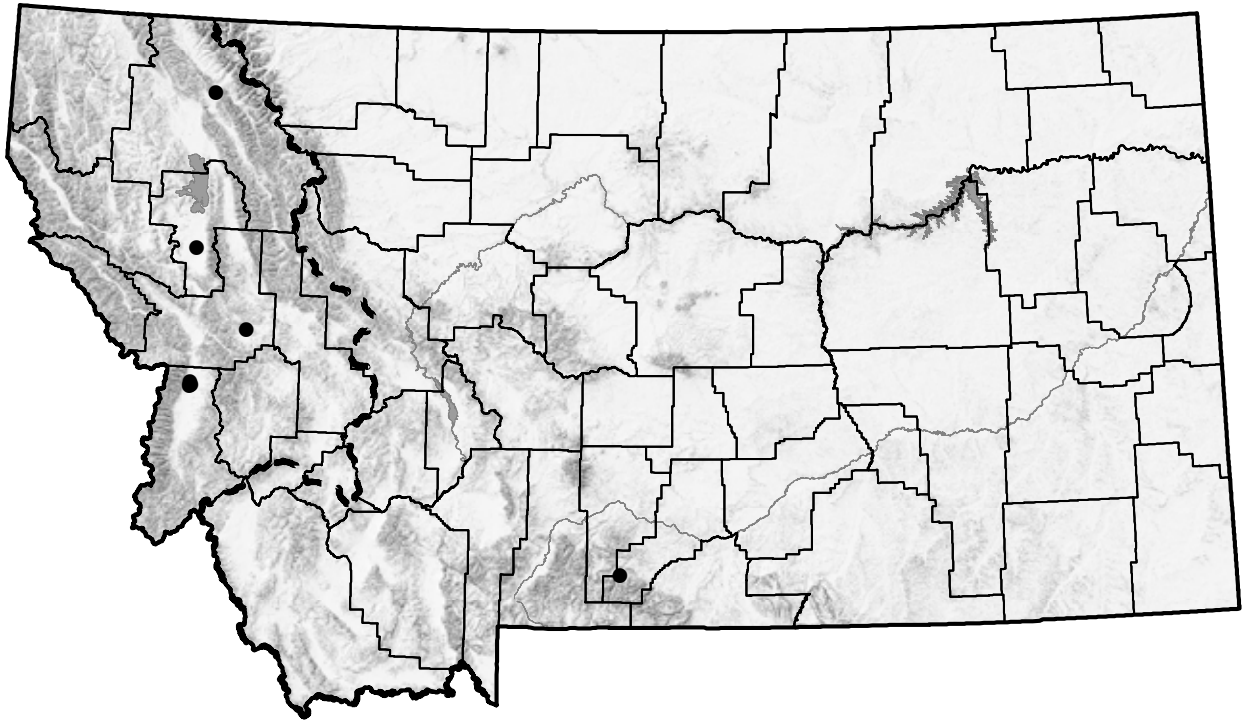


Photo by MTNHP

***Vallonia pulchella* (Müller, 1774) Lovely Vallonia**

**Synonyms:** *Helix pulchella*, *H. minuta*, *Vallonia minuta*.

**Subspecies:** None.

**Description:** A small shell, to about 2.5 mm diameter and 1.2 mm in height, flattened heliciform with fine incremental striae and occasional low wrinkles (not ribbed), about 3 to 3 1/2 whorls, not descending to the aperture. Shell coloration is translucent shiny white. Aperture lip thickened with a rib-like callus, lip flared abruptly outward; umbilicus about 1/4 the shell diameter. Animal is white.

**Internal Anatomy:** Watson 1920.

**Distribution:** Native to Europe, North Africa and northern Asia, and northern and central North America; apparently introduced across many areas of western North America. In Montana, reported on both sides of the Continental Divide from five counties: Flathead, Lake, Missoula, Ravalli, Stillwater. Elevation range is 930 to 1588 m (3050 to 5210 ft).

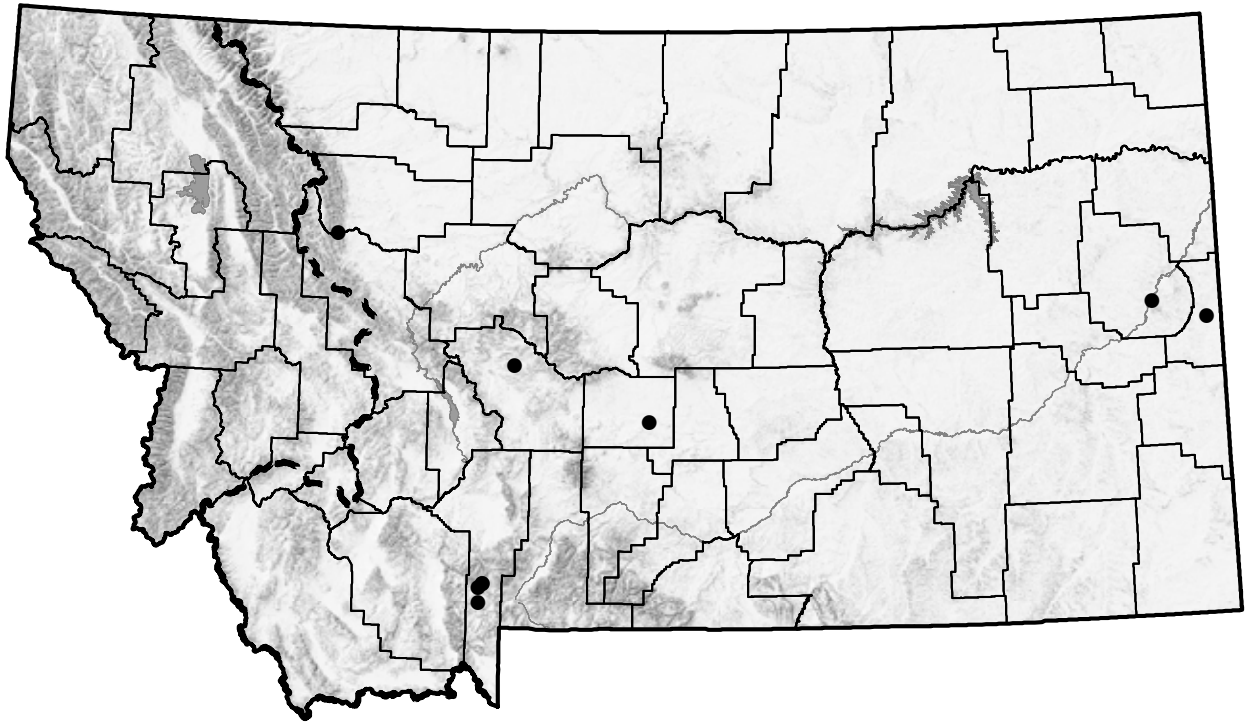
**Habitat:** Inhabits disturbed areas, such as gardens, parks and roadsides, often near moisture. Canopy species include Douglas-fir, ponderosa pine, black cottonwood, lodgepole pine, Engelmann spruce; secondary canopy includes alder and willow. Found under woody debris and rocks, and in leaf litter and duff.

**Conservation Status:** Probably introduced; no special status in Montana (G5 SNA).

**Remarks:** The Squyer record from Wibaux County was determined by Henderson to be worn shells of *Vallonia gracilicosta*. May be locally common; 18 live specimens were found at one Ravalli County site in early April.

**Selected References:** Beetle 1961, 1989; Forsyth 2004; Henderson 1936; Hendricks 2009; Pilsbry 1948; Squyer 1894.

***Pupilla blandi* - Rocky Mountain Column**



*Photo by Jeffrey Nekola and Brian Coles 2010.*

***Pupilla blandi* (Morse, 1865) Rocky Mountain Column**

**Synonyms:** *Pupa blandi*, *Pupa sublubrica*.

**Subspecies:** None.

**Description:** A small shell, typically to 1.5 mm diameter and 3.4 mm in height, subcylindrical (pupiform), surface with fine incremental striae, about 6 to 7 whorls. Shell coloration is opaque pale brown. Aperture is rounded to ovate, with three teeth (denticles: parietal, columellar, lower palatal deep within the aperture), crest well developed, sinulus absent, lip sharply expanded and with a moderate to thick callus.

**Internal Anatomy:** Not described.

**Distribution:** Native to North America; Rocky Mountains from Alberta south to Arizona and New Mexico, east as fossils or river drift to the Dakotas, Kansas, Texas. In Montana, reported east of the Continental Divide from six counties: Dawson, Gallatin, Meagher, Teton, Wheatland, Wibaux. Elevation range is 640 to 2228 m (2100 to 7310 ft).

**Habitat:** Not described for Montana. Wooded sites elsewhere under aspen, cottonwood, ponderosa pine, willow. Found under woody debris or rocks, in leaf litter.

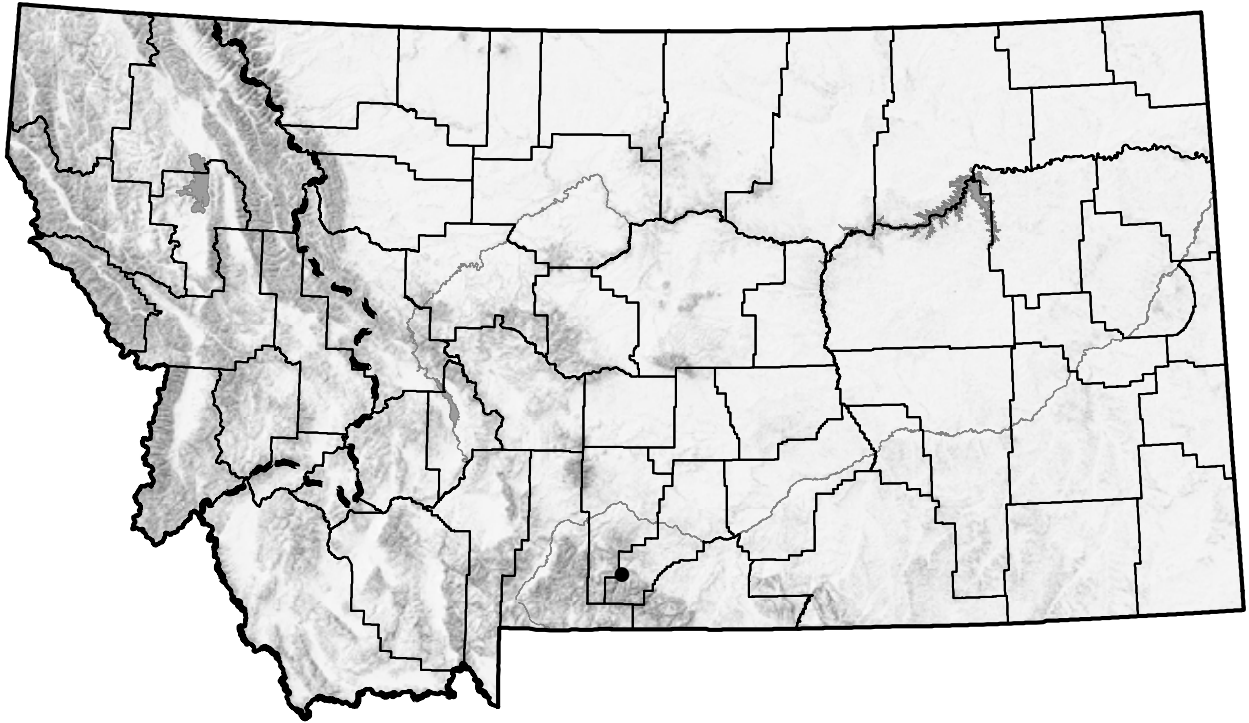
**Conservation Status:** No special status in Montana (G4 SNR).

**Remarks:** Range, abundance, and habitat poorly defined in Montana; current status needs investigation. Forms under this species name in western North America may represent up to three cryptic species (J. Nekola, pers. comm.). Many Montana records appear to be dead shells in river drift.

**Selected References:** Beetle 1989; Berry 1916; Nekola and Coles 2010; Pilsbry 1948; Squyer 1894.



***Pupilla hebes* - Crestless Column**



*Photo by Bill Leonard taken from the collection of TE Burke.*

***Pupilla hebes* (Ancey, 1881) Crestless Column**

**Synonyms:** *Pupa hebes*, *Pupilla muscorum idahoensis*.

**Subspecies:** None.

**Description:** A small shell, 1.5 mm diameter and 3.5 mm in height, subcylindrical (pupiform), surface with fine incremental and wrinkle-like striae, with 6 to 7 whorls. Shell coloration is brownish. Aperture rounded to ovate, without teeth (denticles) but with a columellar baffle behind the columella, sometimes with a slight bulge in place of a parietal tooth, crest low to prominent and the same color as the rest of the shell, sinulus absent, lip expanded (flared) but not thickened (callus absent).

**Internal Anatomy:** Not described.

**Distribution:** In North America from Alaska south to Mexico and east to Idaho and Wyoming. In Montana, reported east of the Continental Divide in Stillwater County; elevation 1731 m (5780 ft).

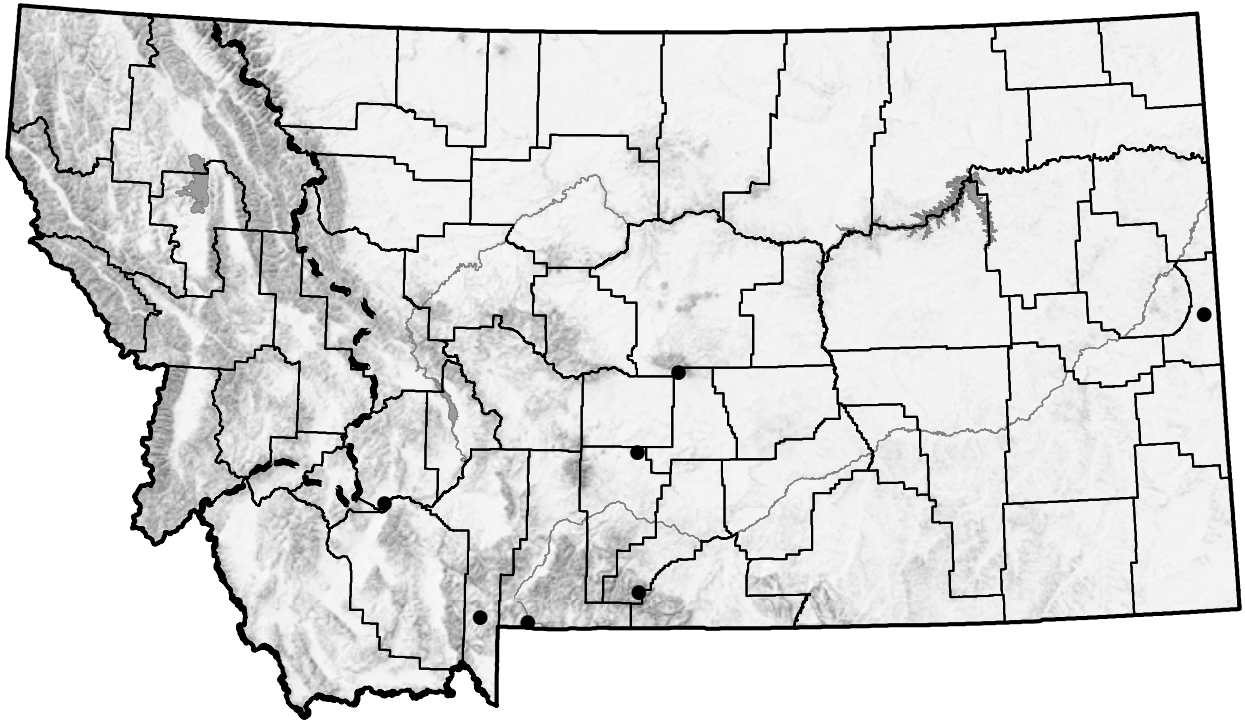
**Habitat:** Not described for Montana; wooded sites elsewhere. Canopy includes aspen, elsewhere in rocky sites under conifers and cottonwoods. Found in leaf litter, among grasses, and under rocks in shrubby sites.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Range, abundance, and habitat poorly defined in Montana; current status needs investigation. Similar to *Pupilla muscorum* but lacks the light colored crest behind the aperture lip and a palatal callus. Forms under this species name in western North America may represent at least three cryptic species (J. Nekola, pers. comm.). Occurs in some locations in both dextral (coiling to the right from the aperture) and sinistral (coiling to the left from the aperture) forms. Nine shells were reported at a Stillwater County site in late August.

**Selected References:** Beetle 1961, 1989; Forsyth 2004; Frest and Johannes 2001; Harris 1978; Nekola and Coles 2010; Pilsbry 1948.

*Pupilla muscorum* - Widespread Column



*Photo by Malcolm Storey*

***Pupilla muscorum* (Linnaeus, 1758) Widespread Column**

**Synonyms:** *Turbo muscorum*, *Pupa muscorum*, *Pupa badia*.

**Subspecies:** None.

**Description:** A small shell, to about 1.7 mm diameter and 3.7 mm in height, subcylindrical (pupiform), surface nearly smooth with fine irregular striae, about 6 to 7 whorls, last half of the final whorl compressed. Shell coloration is brownish (lighter if periostracum is worn off). Aperture is rounded to ovate, typically without teeth (denticles) although sometimes with a small parietal bulge, a somewhat developed columellar tooth, and a small lower palatal tubercle, crest well developed and paler than remainder of shell, sinulus absent, lip whitish, slightly expanded (flared) and thickened inside with a callus.

**Internal Anatomy:** Pilsbry 1948.

**Distribution:** Native to Eurasia and much fo North American; in the west to Arizona and New Mexico (unconfirmed Oregon). In Montana, reported east of the Continental Divide from seven counties: Gallatin, Golden Valley, Jefferson, Park, Stillwater, Sweet Grass, Wibaux. Elevation range is 823 to 2039 m (2700 to 6690 ft).

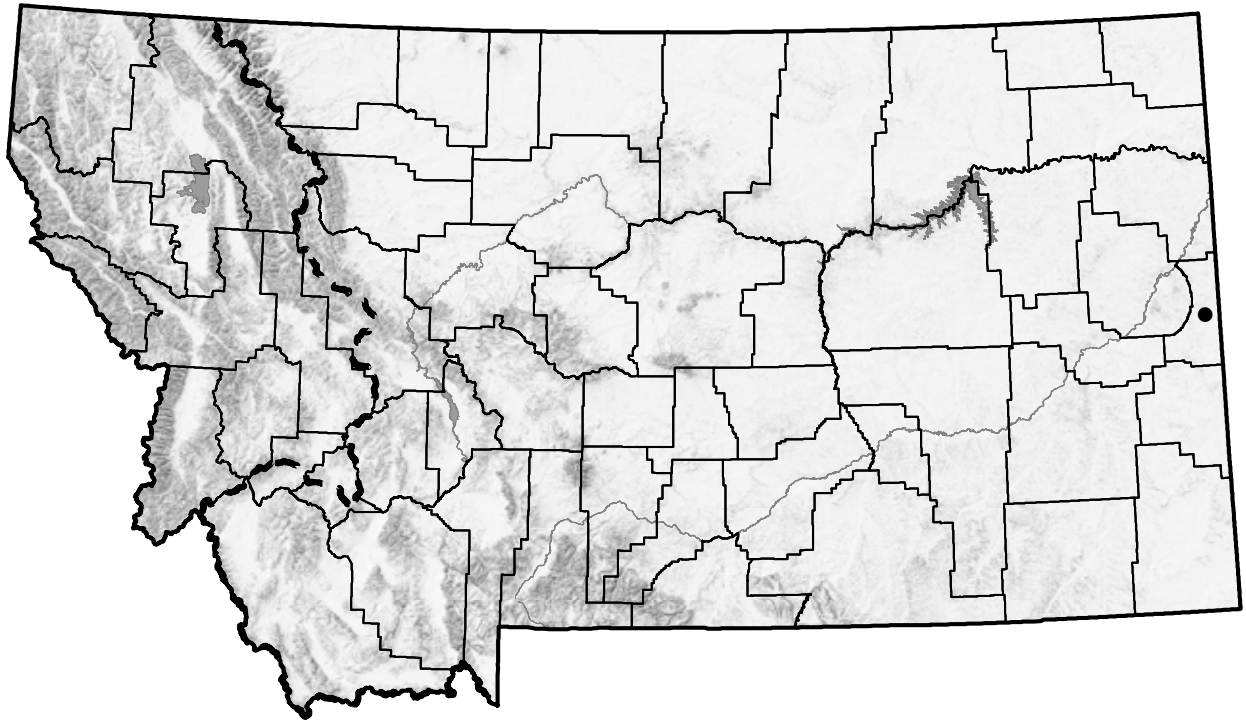
**Habitat:** Forested sites; canopy species include aspen, Douglas-fir, Engelmann spruce, Rocky Mountain juniper. Found under woody debris, moss, in talus, and leaf litter.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Similar to *Pupilla hebes* but possesses a pale crest and a palatal callus lacking in that species. Forms under this species name probably are related to western *Pupilla blandi*, *P. hebes*, or may be an undescribed taxon related to the European species *P. alpicola* (J. Nekola, pers. comm.). Occurs in some locations in both dextral (coiling to the right from the aperture) and sinistral (coiling to the left from the aperture) forms. Range, abundance, and habitat poorly defined in Montana; current status needs investigation. May be abundant at some localities; 68 were reported at one Jefferson County site in late June.

**Selected References:** Beetle 1961, 1989, 1997; Berry 1916; Harris 1978; Henderson 1933; Nekola and Coles 2010; Pilsbry 1948; Squyer 1894.

*Pupilla syngenes* - Top-heavy Column



*Image not available*

***Pupilla syngenes* (Pilsbry, 1890) Top-heavy Column**

**Synonyms:** *Pupa syngenes*.

**Subspecies:** *P. s. syngenes*.

**Description:** A small shell, to about 1.7 mm diameter and 4.0 mm in height, subcylindrical (pupiform) and barely tapering with a top-heavy profile, surface dull with fine axial striae, 8 or 9 whorls, the last compressed and flattened around the lower portion; usually sinistral (coiling to the left from the aperture). Shell coloration is reddish-brown. Aperture subovate, with a single small tooth (denticle: parietal), a blunt columellar tooth may be evident beyond the aperture, a small palatal tooth well within the aperture, crest prominent, lip flared.

**Internal Anatomy:** Not described.

**Distribution:** Native to the southwest (Utah, Colorado, Arizona, New Mexico) and north to Montana. In Montana, reported east of the Continental Divide from Wibaux County; elevation 823 m (2700 ft).

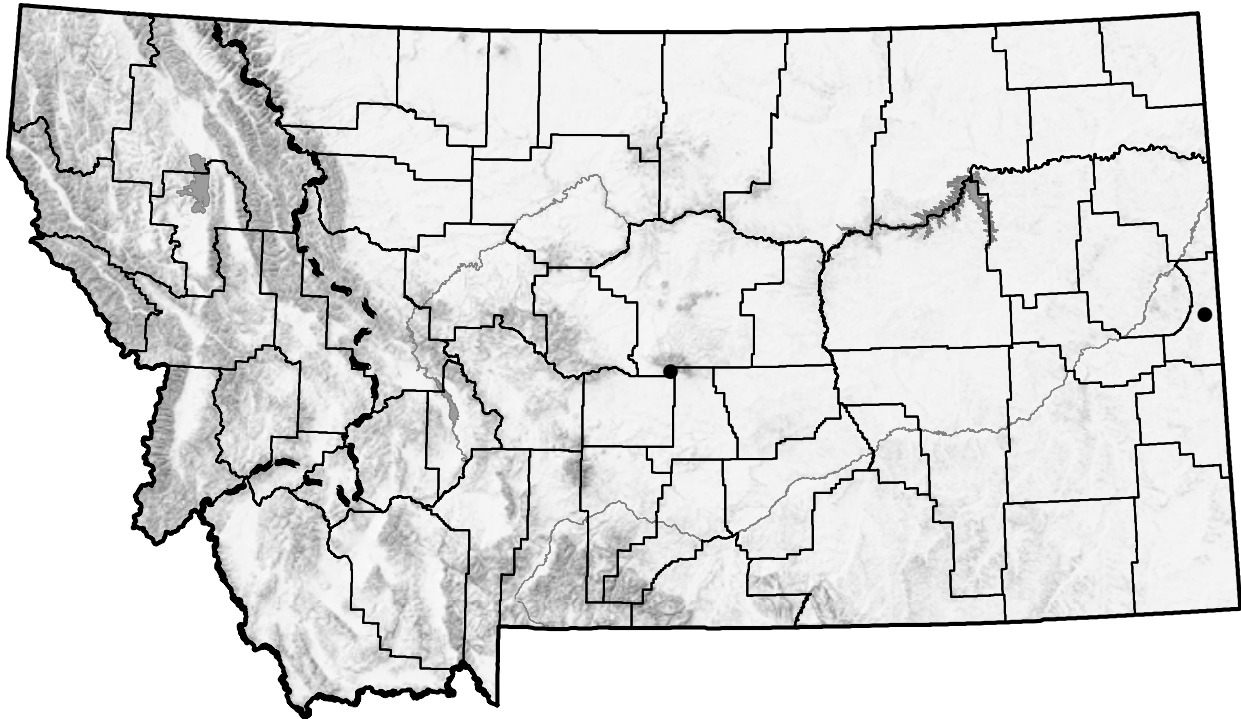
**Habitat:** Not described for Montana. Well-drained hillsides in arid country, not under dense forest canopy; found among grass and under rocks.

**Conservation Status:** No special status in Montana (G4 SNR).

**Remarks:** Occurs in some locations in both dextral (coiling to the right from the aperture) and sinistral (coiling to the left from the aperture) forms. Range, abundance, and habitat poorly defined in Montana; current status needs investigation. Drift material (dead shells) may constitute the single Montana record, when 8 shells were reported.

**Selected References:** Dall 1894; Henderson 1924; Pilsbry 1948; Squyer 1894.

***Gastrocopta armifera* - Armed Snaggleteeth**



*Photo by Larry Watrous*



***Gastrocopta armifera* (Say, 1821) Armed Snaggletooth**

**Synonyms:** *Pupa armifera*, *Bifidaria armifera*.

**Subspecies:** probably *G. a. abbreviata*.

**Description:** a small shell, to about 2.2 mm diameter and 4.5 mm in height, subcylindrical (pupiform) and tapering with weak irregular striae, about 6 1/2 whorls. Shell coloration translucent white. Aperture rounded to subovate, with 6 teeth (denticles: forked parietal, columellar, subcolumellar, lower palatal, upper palatal, suprapalatal), palatal callus present, sinus absent, lip thin and flared.

**Internal Anatomy:** Pilsbry 1948.

**Distribution:** Eastern Canada and the United States south to Florida and west to Alberta, Texas and New Mexico. In Montana, reported east of the Continental Divide from two counties: Golden Valley ("Snowy Mountains"), Wibaux. Elevation range is 823 to 1829 m (2700 to 6000 ft).

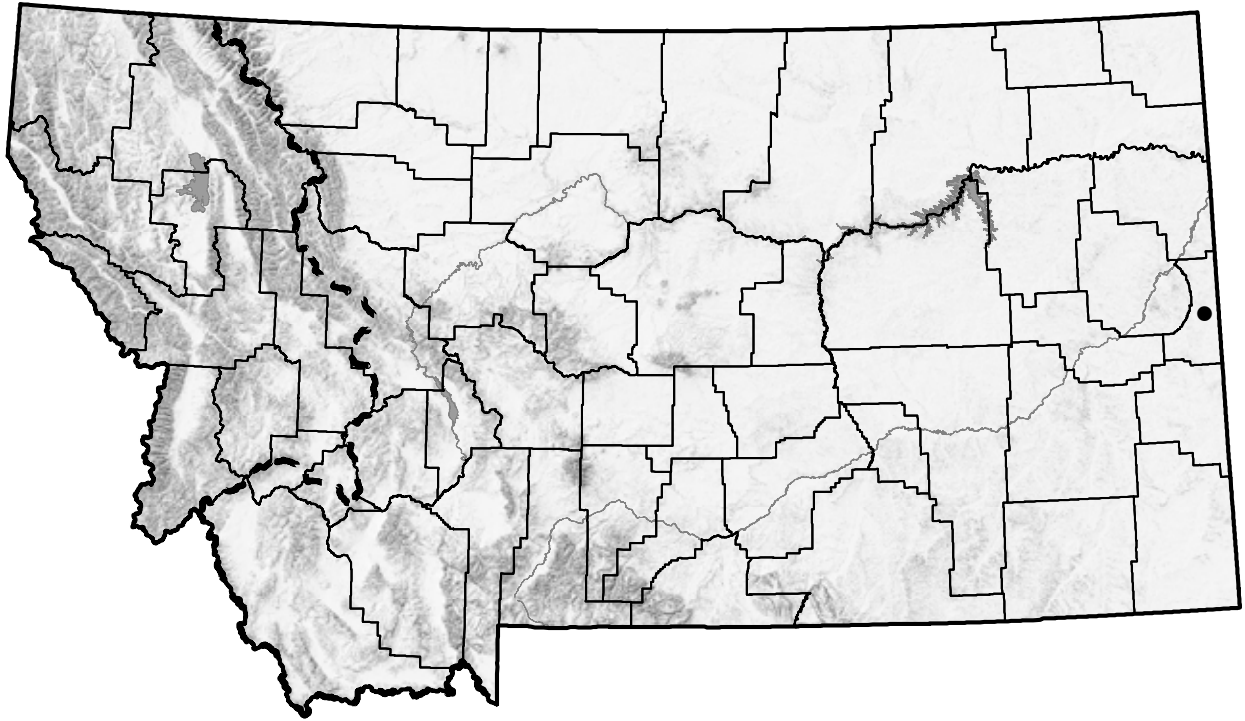
**Habitat:** Not described for Montana; ponderosa pine and Rocky Mountain juniper woodland on rocky outcrops adjacent to water in Wyoming. Found in arid sites under woody debris (logs).

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Range, abundance, and habitat poorly defined in Montana; current status needs investigation. The Golden Valley County ("Snow Mountains") location is a guess, and might actually be in Wheatland County along the Musselshell River at Winnecook, where Stillman Berry collected in 1911, which is the date of the "Snow Mountains" collection attributed to V. Sterki. Four individuals were collected at the site. Individuals attributed to this species in Montana are now probably referable to *Gastrocopta abbreviata* (J. Nekola, pers. comm.); *G. armifera* occurs west only to western Minnesota.

**Selected References:** Beetle 1989; Berry 1913; Nekola and Coles 2010; Pilsbry 1948; Squyer 1894.

***Gastrocopta holzingeri* - Lambda Snaggleteooth**



*Photo by Jeffrey Nekola and Brian Coles 2010.*

***Gastrocopta holzingeri* (Sterki, 1889)   Lambda Snaggleteooth**

**Synonyms:** *Pupa holzingeri*.

**Subspecies:** *G. h. holzingeri*.

**Description:** A very small shell, to 0.8 mm diameter and 1.9 mm in height, subcylindrical (pupiform) and tapering, about 5 whorls. Shell coloration is translucent white. Aperture oval, with six teeth (denticles: forked parietal, columellar, subcolumellar, lower palatal, upper palatal, suprapalatal), the forked parietal tooth in the shape of the Greek letter λ with one end attached to the aperture lip, columellar tooth curves downward within the aperture, palatal callus present, sinulus absent, crest present and oblique, lip thin and flared.

**Internal Anatomy:** Not described.

**Distribution:** Ontario and western New York west to Alberta and Montana, south to Kansas and New Mexico. In Montana, reported east of the Continental Divide from two counties: Lewis and Clark, Wibaux. Elevation range is 823 to 1372 m (2700 to 4500 ft).

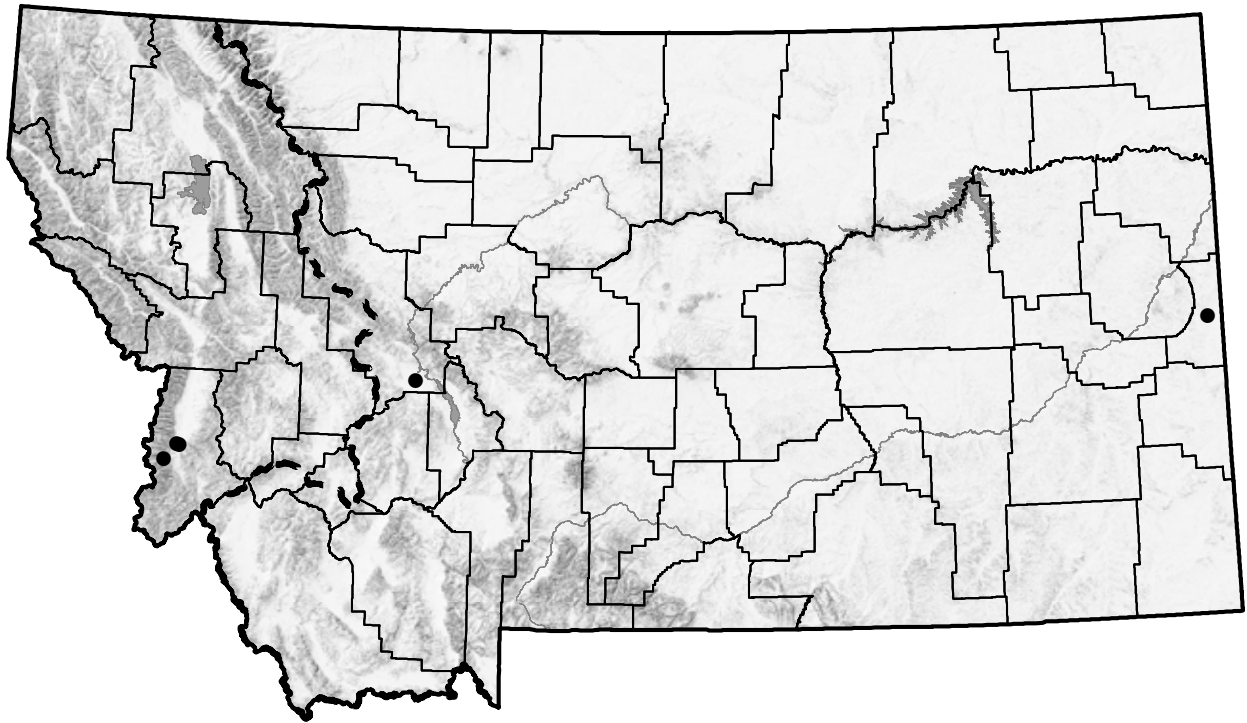
**Habitat:** Not described for Montana. Wooded slopes under moist leaf litter in British Columbia.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Range, abundance, and habitat poorly defined in Montana; current status needs investigation.

**Selected References:** Forsyth 2004; Nekola and Coles 2010; Pilsbry 1948; Squyer 1894.

***Gastrocopta pentodon* - Comb Snaggleteeth**



*Photo by David Kirsh*

***Gastrocopta pentodon* (Say, 1821) Comb Snaggleteeth**

**Synonyms:** *Vertigo pentodon*, *Pupa pentodon*, *Bifidaria pentodon*, *Pupa curvidens*.

**Subspecies:** None.

**Description:** A very small snail, to 1.1 mm diameter and 1.9 mm in height, subcylindrical (pupiform) and tapering, surface smooth, about 5 whorls. Shell coloration is translucent white. Aperture subovate, typically with 5 teeth (denticles: parietal, columellar, subcolumellar, lower palatal, upper palatal) but sometimes to 8 teeth, parietal tooth not shaped like the Greek letter λ, columellar tooth not curving downward within the aperture, palatal callus present, sinulus absent, crest low to well developed, lip thin and slightly flared.

**Internal Anatomy:** Not described.

**Distribution:** Eastern Canada and the United States west to Alberta, south to Florida, Arizona, New Mexico, Texas, into eastern Mexico and Guatemala. In Montana, reported on both sides of the Continental Divide from three counties: Lewis and Clark, Ravalli, Wibaux. Elevation range is 823 to 1829 m (2700 to 6000 ft).

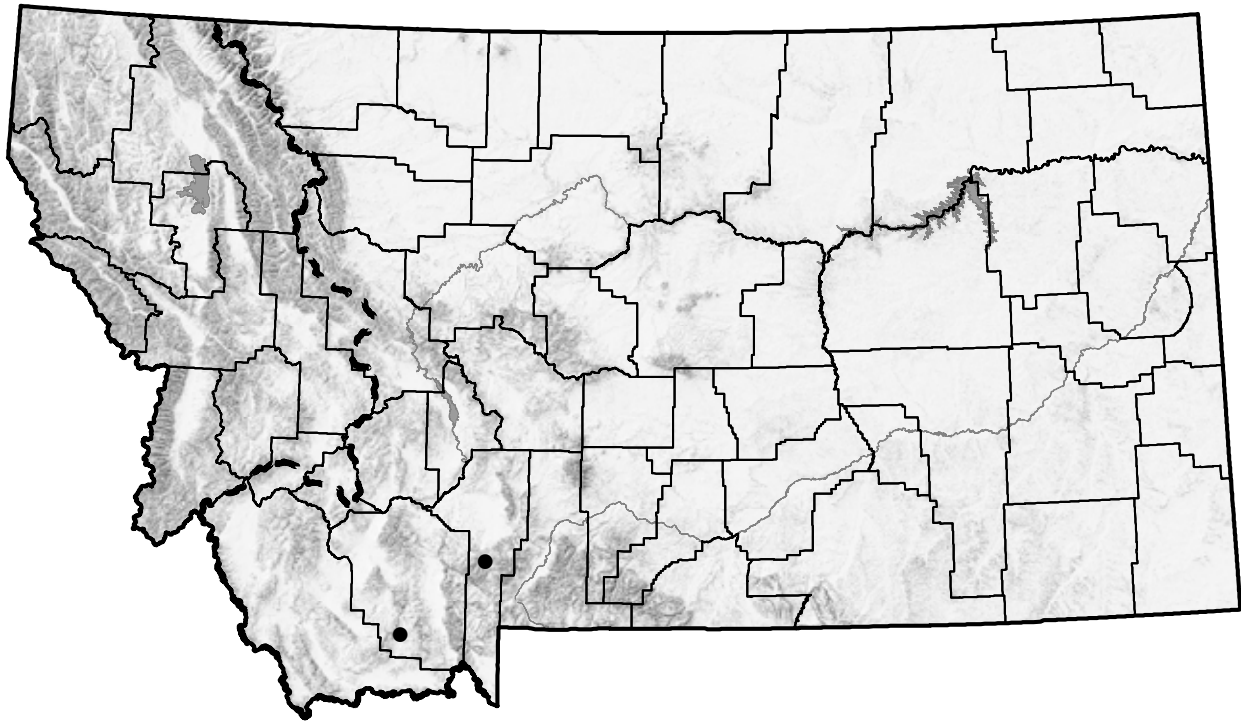
**Habitat:** Not described for Montana. Forest canopy includes aspen and brushy hillsides, sometimes in openings. Found in leaf litter, moss, grass, or duff.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Shape variable, more conical in wet localities. Range, abundance, and habitat poorly defined in Montana; current status needs investigation. This species in Montana is probably referable to *Gastrocopta tappeaniana* (J. Nekola, pers. comm.); true *G. pentodon* occurs west only to eastern North Dakota.

**Selected References:** Forsyth 2004; Harris 1978; Henderson 1924; Nekola and Coles 2010; Pilsbry 1948; Squyer 1894; Sterki 1890b; Vanatta 1914.

*Columella columella* - Mellow Column



*Photo by Jeffrey Nekola and Brian Coles 2010.*

***Columella columella* (von Martens, 1830) Mellow Column**

**Synonyms:** *Columella alticola*.

**Subspecies:** None.

**Description:** A small shell, to 1.6 mm diameter and 2.9 mm in height, subcylindrical (pupiform) with coarse and irregular incremental striae, about 6 to 7 whorls, the last or second to last whorl before the aperture smaller than the adjacent whorls (giving a slightly pinched profile). Shell coloration is translucent brown to reddish-brown. Aperture is ovate, the lip unthickened and without teeth (denticles); periphery rounded; umbilicus very small.

**Internal Anatomy:** Pokryszko 1990.

**Distribution:** Circumboreal across higher latitudes and elevations; in western North America south to Arizona and New Mexico. In Montana, reported east of the Continental Divide from two counties: Gallatin and Madison. Elevation range is 1777 to 2027 m (5830 to 6650 ft).

**Habitat:** Moist forested sites, aspen pockets, moist open meadows. Canopy species include Douglas-fir, Engelmann spruce, subalpine fir, limber pine, and aspen. Found under woody debris, on logs, vegetation, bryophyte mats, and in leaf litter.

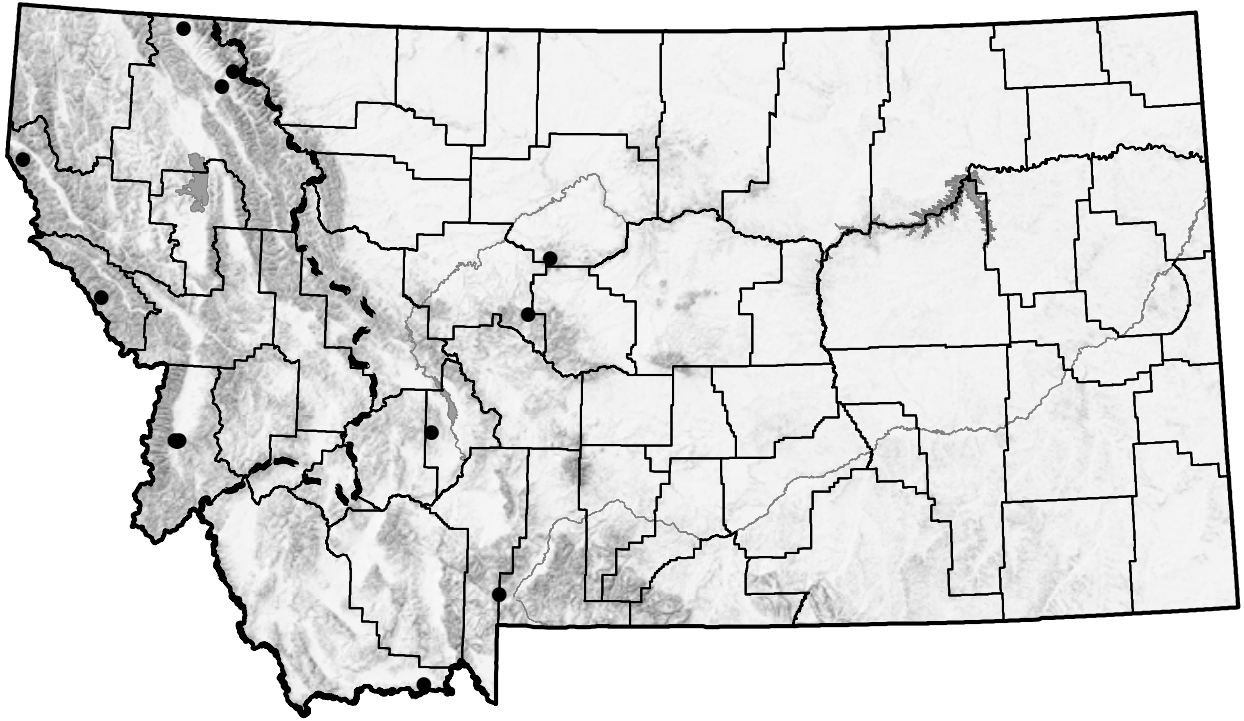
**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Reports of this species by Vanatta for Ravalli County were considered by Henderson to be *Columella edentula*. Range and habits in Montana poorly defined. May be locally relatively common; 10 individuals were reported at one Madison County site in late October.

**Selected References:** Beetle 1989; Forsyth 2004; Frest and Johannes 2001; Henderson 1924; Pilsbry 1948; Vanatta 1914.



***Columella edentula* - Toothless Column**



*Photo by MTNHP*

***Columella edentula* (Draparnaud, 1805) Toothless Column**

**Synonyms:** *Pupa edentula*, *Pupa simplex*, *Vertigo simplex*, *Columella simplex*.

**Subspecies:** None.

**Description:** A small shell, about 1.4 mm diameter and 2.5 mm in height, subcylindrical (pupiform) and tapering, with low axial striae, about 5 or 6 whorls, the last larger than the penultimate. Shell coloration is translucent brown to reddish-brown and glossy. Aperture is ovate, unthickened, and without teeth (denticles); periphery rounded; umbilicus is very small.

**Internal Anatomy:** Pokryszko 1990.

**Distribution:** Native from northwest Europe to central Asia and northern North America. In Montana, reported on both sides of the Continental Divide from nine counties: Beaverhead, Broadwater, Cascade, Chouteau, Flathead, Gallatin, Mineral, Ravalli, Sanders. Elevation range is 954 to 2219 m (3130 to 7280 ft).

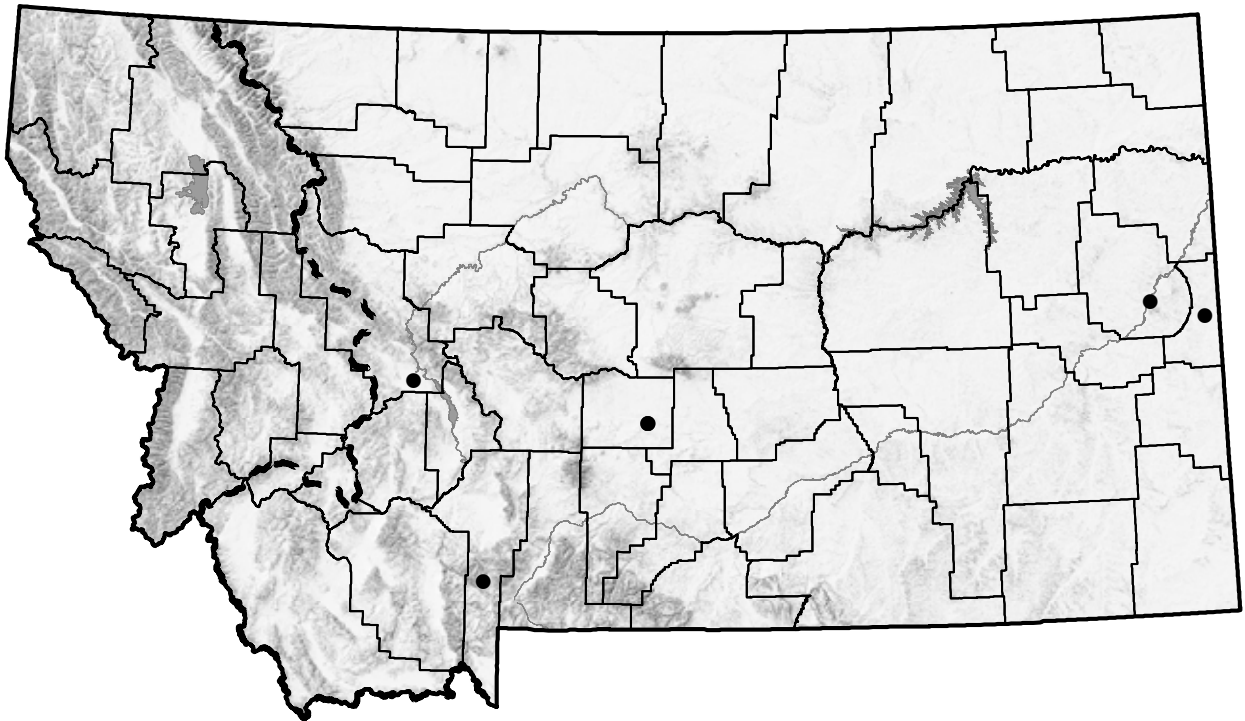
**Habitat:** A diversity of moist sites, including isolated aspen stands. Canopy species include western redcedar, western hemlock, grand fir, Engelmann spruce, Douglas-fir, lodgepole pine, black cottonwood, aspen, paper birch; secondary canopy includes alder, dogwood and mountain maple. Often found under woody debris, on logs and vegetation, and in leaf litter.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Small juveniles resemble *Punctum*, and can be confused with toothless juvenile *Vertigo*. *Columella alticola* reported by Vanatta from Ravalli County were placed under this species by Henderson. Appears to be uncommon at most locations; up to five were reported at one Beaverhead County site in early July.

**Selected References:** Beetle 1989; Forsyth 2004; Frest and Johannes 2001; Henderson 1924; Hendricks 2009; Pilsbry 1948; Russell and Brunson 1967; Vanatta 1914.

***Vertigo binneyana* - Cylindrical Vertigo**



*Photo by Jeffrey Nekola and Brian Coles 2010.*

***Vertigo binneyana* Sterki, 1890    Cylindrical Vertigo**

**Synonyms:** None.

**Subspecies:** None.

**Description:** A small shell, about 1.1 mm diameter and 2.1 mm in height, subcylindrical (pupiform) and tapering, weak and irregular axial striae, about 5 whorls. Shell coloration is translucent reddish-brown and glossy. Aperture subovate, with six teeth (denticles: parietal, columellar, lower palatal, upper palatal, angular, infrapalatal), a moderate palatal callus, a weakly indented sinus, a crest behind the lip.

**Internal Anatomy:** Not described.

**Distribution:** North America scattered across Alberta, Manitoba, New Mexico and Montana. In Montana, six records east of the Continental Divide from five counties: Dawson (1), Gallatin (1), Lewis and Clark (1), Wheatland (2), Wibaux (1). Elevation range is 640 to 1890 m (2100 to 6200 ft).

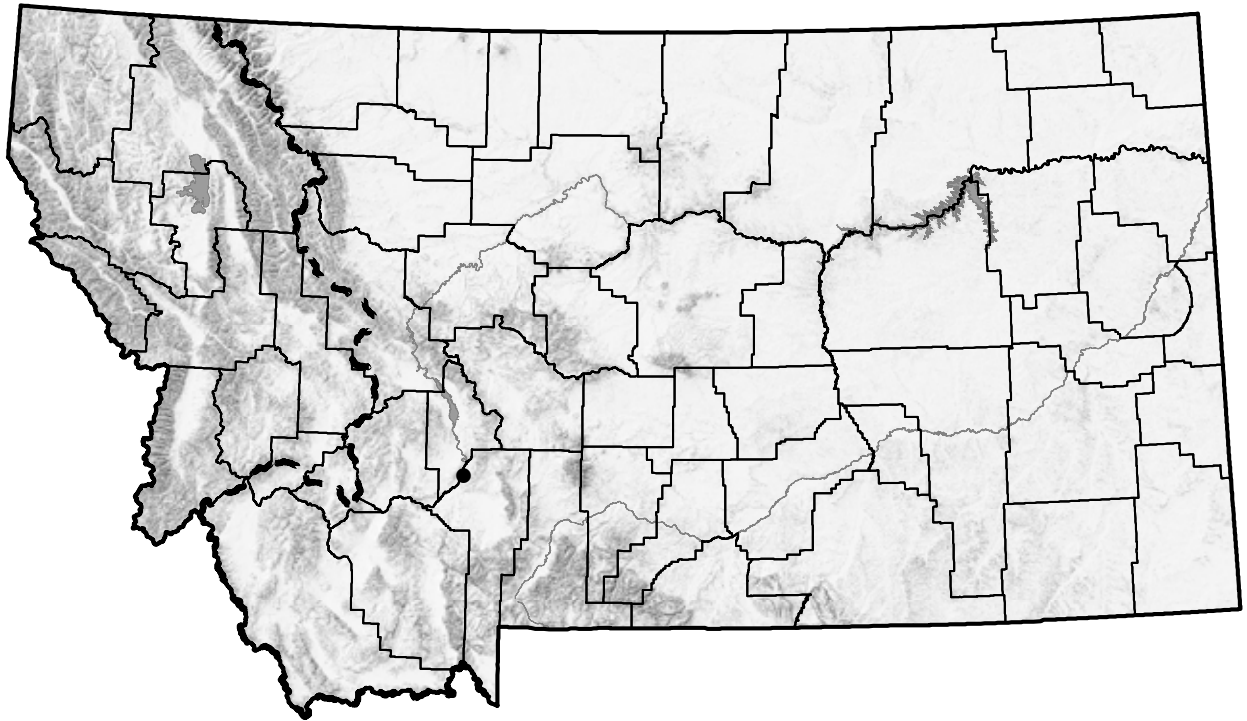
**Habitat:** Moist sites with a canopy of plains cottonwood; found under woody debris, rocks, and in leaf litter. Alberta records are from sites with forest canopy including Engelmann spruce, lodgepole pine, Douglas-fir and aspen.

**Conservation Status:** Montana Species of Concern (G1 S1).

**Remarks:** The original description was based on specimens collected about 1890 at Helena. Range and habitat in Montana are poorly defined and, no contemporary records exist; current status needs investigation. May be relatively common at some locations; 88 (7 live, 81 shells) were reported at the Wheatland County site.

**Selected References:** Berry 1913, 1916; Forsyth 2004; Harris 1978; Henderson 1924; Pilsbry 1948; Squyer 1894; Sterki 1890a, 1890b.

### *Vertigo concinnula* - Mitered Vertigo



*Photo by Harry G. Lee*

***Vertigo concinnula* Cockerell, 1897    Mitered Vertigo**

**Synonyms:** *Pupa ingersolli*.

**Subspecies:** None.

**Description:** A small shell, to 1.2 mm diameter and 2.3 mm in height, subcylindrical (pupiform) and slightly tapering with moderate and irregular striae, about 5 whorls. Shell coloration is translucent and dull reddish-brown, sometimes with paler flecks. Aperture subovate, with 5 teeth (parietal, columellar, upper palatal, lower palatal, angular), palatal callus absent, but parietal and palatal teeth elongate, sinus absent or very weak, crest moderate to well-developed.

**Internal Anatomy:** Not described.

**Distribution:** Native to North America; primarily in Rocky Mountains from Idaho to Arizona and New Mexico but also Oregon and South Dakota. In Montana, one report east of the Continental Divide, from Gallatin County: elevation 1158 m (3800 ft).

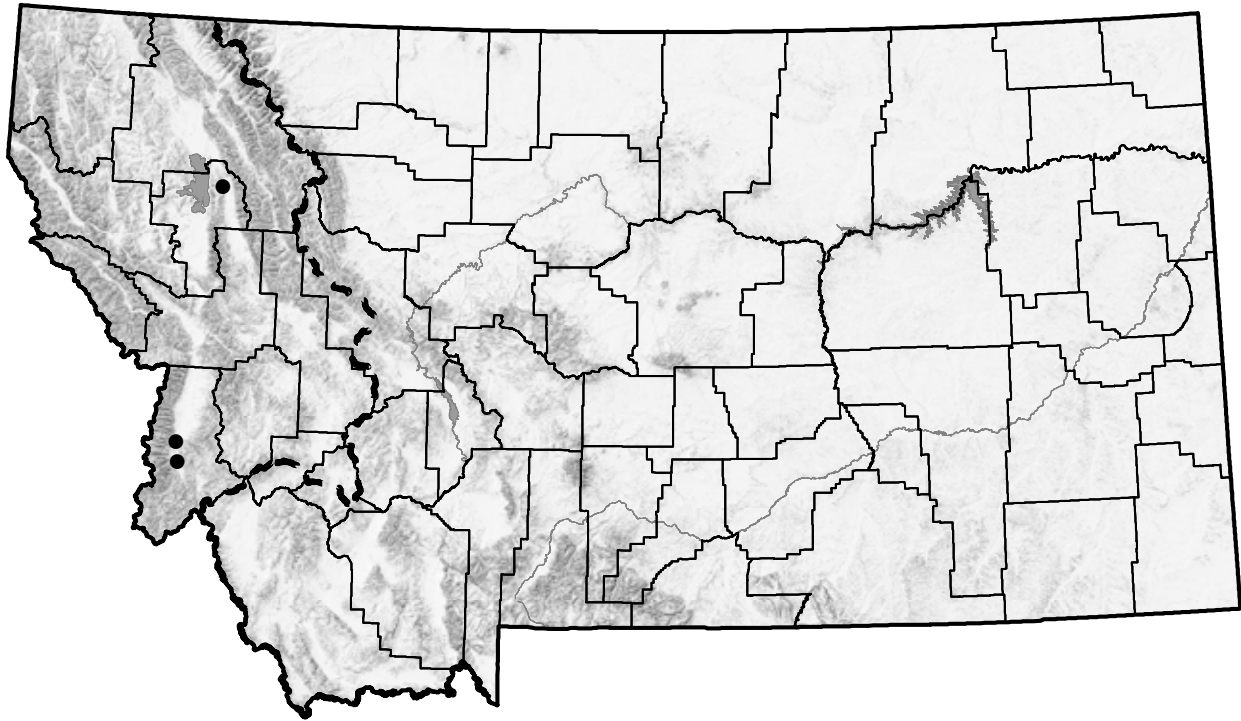
**Habitat:** Not described for Montana; moist sites in aspen and riparian willow thickets in Wyoming. Found under woody debris and leaf litter.

**Conservation Status:** No special status in Montana (G4G5 SNR).

**Remarks:** Range and habitat in Montana poorly defined, no contemporary records; current status needs investigation.

**Selected References:** Beetle 1961, 1989; Frest and Johannes 2001; Henderson 1924, 1936; Pilsbry 1948.

***Vertigo elatior* - Tapered Vertigo**



*Photo by Jeffrey Nekola and Brian Coles 2010.*



***Vertigo elatior* Sterki, 1894    Tapered Vertigo**

**Synonyms:** *Vertigo ventricosa elatior*, *V. gouldi lagganensis*.

**Subspecies:** None.

**Description:** A small shell, about 1.2 mm diameter and 2.2 mm in height, subovate (pupiform) with a moderately long and distinctly tapered spire, nearly smooth with only very fine incremental striae, about 5 whorls. Shell coloration is glossy brown. Aperture subovate, with five teeth (denticles: parietal, columellar, subcolumellar, upper palatal, lower palatal), palatal callus slight or absent, sinulus more or less strongly indented, crest weak or absent, lip thin and flared.

**Internal Anatomy:** Not described.

**Distribution:** Eastern Canada and northeastern United States west to Alberta, British Columbia, and Montana. In Montana, reported west of the Continental Divide from two counties: Lake, Ravalli. Elevation range is 1219 to 1262 m (4000 to 4140 ft).

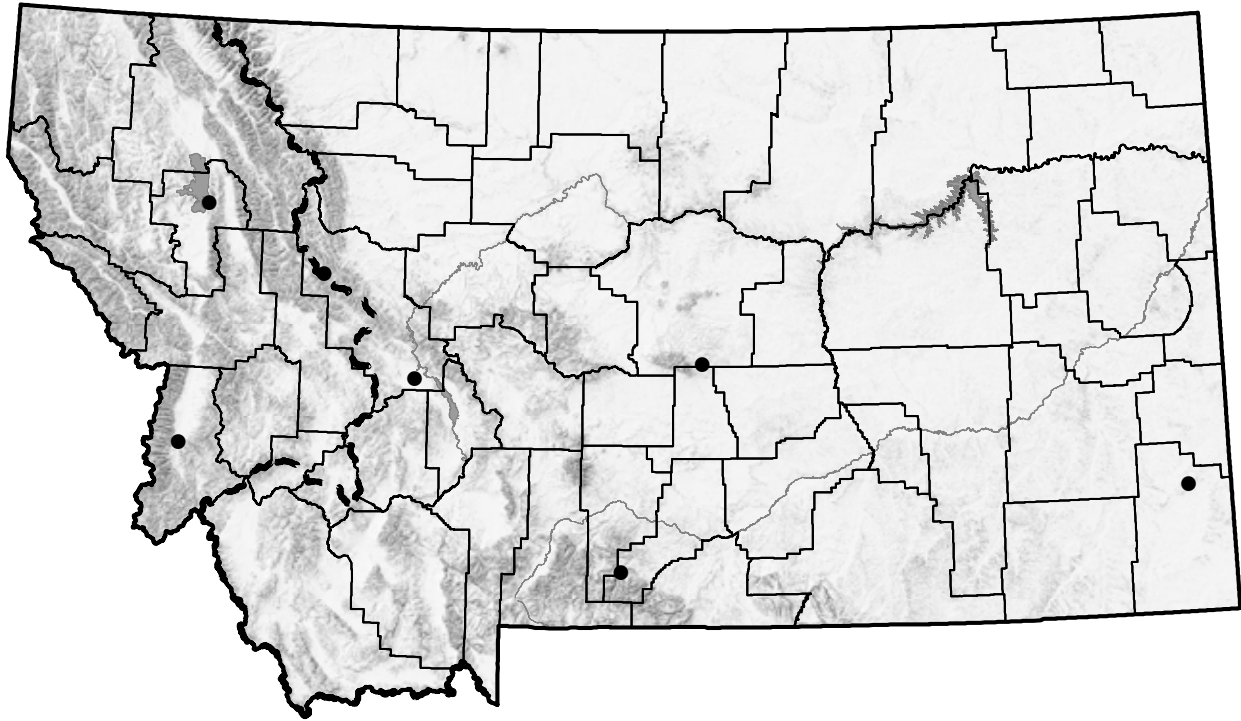
**Habitat:** Not described for Montana; moist sites in aspen and willow stands in Wyoming. Found under woody debris and leaf litter.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Range, abundance, and habitat in Montana poorly defined; current status needs investigation. Apparently never locally abundant; four were reported at the Lake County site in early July.

**Selected References:** Beetle 1989; Forsyth 2004; Pilsbry 1948; Vanatta 1914.

*Vertigo gouldi* - Variable Vertigo



*Photo by Harry G. Lee*

***Vertigo gouldi* (Binney, 1843)    Variable *Vertigo***

**Synonyms:** *Vertigo gouldii*, *Pupa gouldii*, *Pupa coloradensis*.

**Subspecies:** *V. g. basidens*, *V. g. coloradensis*; need reevaluation.

**Description:** A very small shell, to about 1.0 mm diameter and 1.9 mm in height, subcylindrical (pupiform) and tapering with nearly regular axial striae-riblets, about 4 1/2 to 5 whorls. Shell coloration is silky pale brown to reddish-brown. Aperture subovate, with 4-6 (usually 4-5) teeth (denticles: parietal, columellar, upper palatal, lower palatal, sometimes a subcolumellar), palatal callus more or less distinct, sinulus weak, crest usually moderate, lip slightly thickened and weakly flared; umbilicus very small or closed.

**Internal Anatomy:** Not described.

**Distribution:** North America south to Kansas, Missouri, and Alabama, in the west Rocky Mountains to Arizona and New Mexico. In Montana, reported on both sides of the Continental Divide from five counties: Carter, Fergus, Lake, Lewis and Clark, Stillwater. Elevation range is 931 to 1731 m (3055 to 5680 ft).

**Habitat:** Forests, aspen stands, damp sites. Canopy tree species include aspen and ponderosa pine. Found under woody debris, in leaf litter, moss, and duff.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Range, abundance, and habitat in Montana poorly defined; only a few specimens have been reported at any locality. Recent genetic analyses indicate Montana specimens of *Vertigo gouldi* should be considered *V. arthuri* or *V. coloradensis* (Nekola pers. comm.).

**Selected References:** Beetle 1961, 1989, 1997; Forsyth 2004; Nekola et al. 2009; Nekola and Coles 2010; Pilsbry 1948; Sterki 1890b; Vanatta 1914.

*Vertigo modesta* - Cross Vertigo

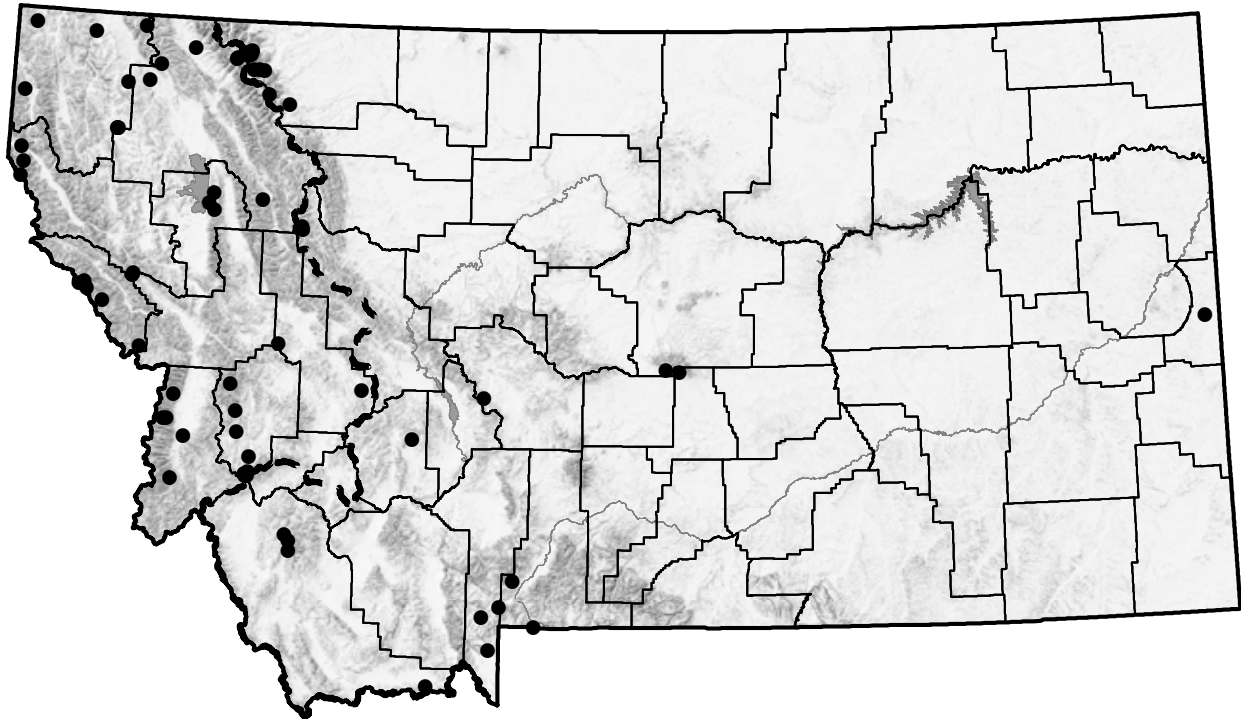


Photo by MTNHP

***Vertigo modesta* (Say, 1824) Cross Vertigo**

**Synonyms:** *Pupa modesta*, *P. decora*.

**Subspecies:** *V. m. parietalis*, *V. m. corpulenta*, *V. m. sculptilis*; possibly invalid.

**Description:** A small shell, to about 1.4 mm diameter and 2.7 mm in height, subcylindrical (pupiform) and tapering, irregular weak to strong axial striae most distinct on the middle whorls, about 4 to 5 whorls. Shell coloration is glossy brown to reddish brown. Aperture is subovate, often with 4 or 5 teeth (denticles: parietal, columellar, lower palatal, upper palatal, sometimes a small angular) but sometimes fewer or none, no palatal callus or sinulus, lip curvature only slightly flattened, outer lip somewhat thickened and scarcely flared, crest weak to moderately developed; periphery rounded; umbilicus very small.

**Internal Anatomy:** Not described.

**Distribution:** Alaska to Labrador and south to New England, west to California and Colorado. In Montana, reported on both sides of the Continental Divide from 17 counties. Elevation range is 655 to 2518 m (2150 to 8260 ft).

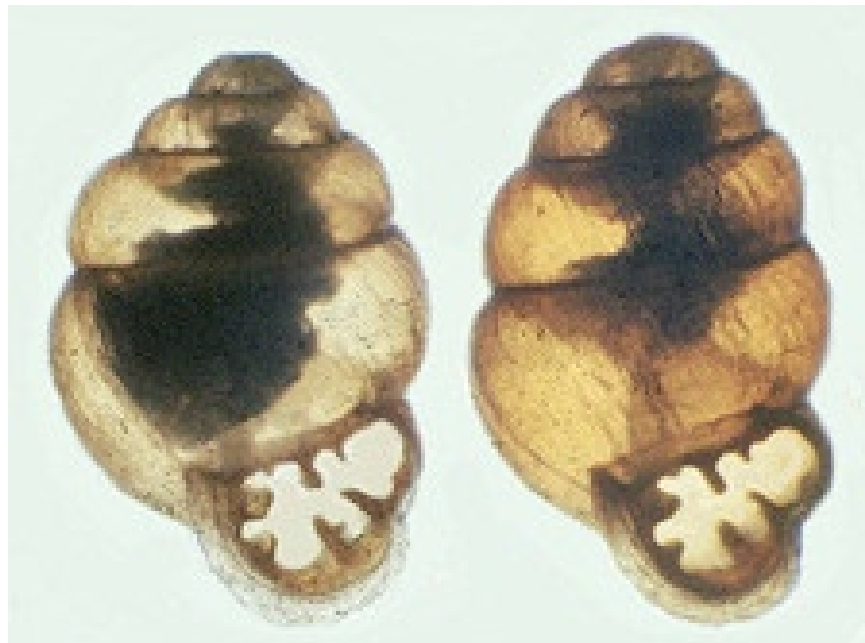
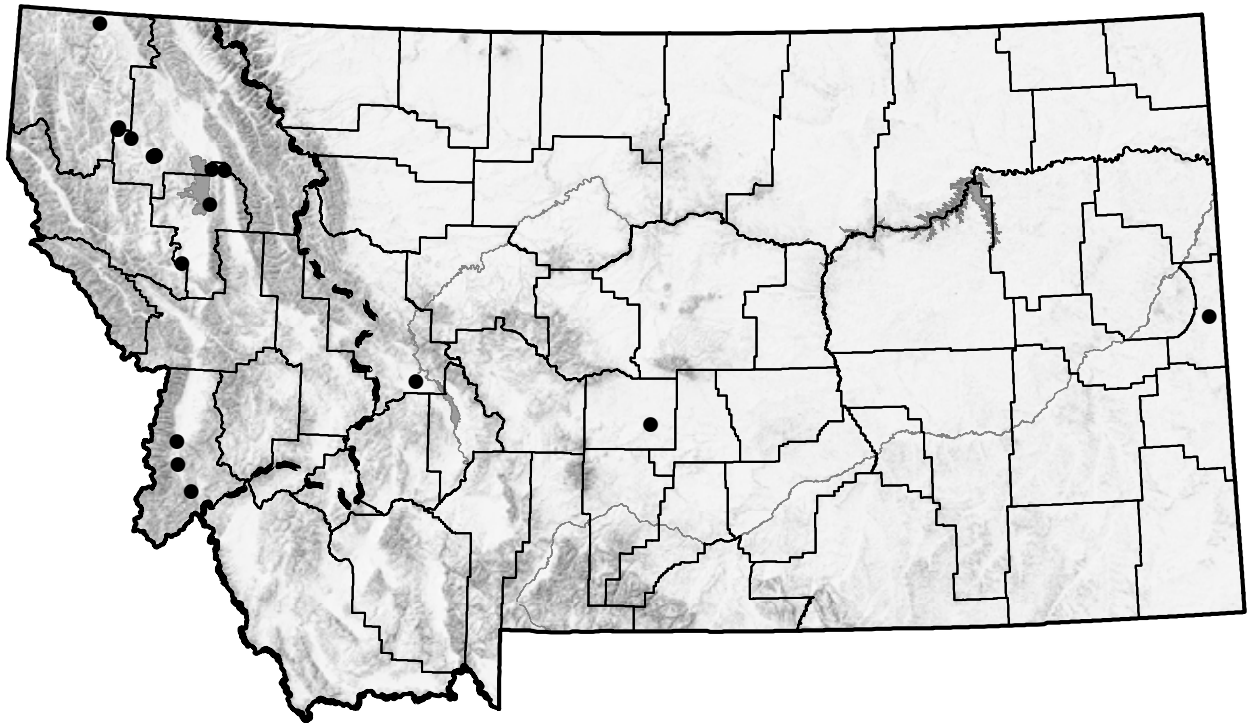
**Habitat:** Moist forested or wooded sites, near water, sometimes in campgrounds. Canopy species include western redcedar, western hemlock, grand fir, Engelmann spruce, subalpine fir, Douglas-fir, lodgepole pine, whitebark pine, western larch, ponderosa pine, black cottonwood, and aspen; secondary canopy includes alder, willow, and paper birch. Found on or under rocks and woody debris (sometimes immediately next to streams), in leaf litter or duff, on vegetation.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Local variation in the number of teeth is not uncommon. Many Montana shells have 2 teeth (parietal and a small angular) on the parietal wall, fitting the description of *Vertigo modesta parietalis*. Can be abundant in some localities; 70 were reported at one Glacier County site in Glacier National Park in late August.

**Selected References:** Beetle 1989; Berry 1916, 1919; Forsyth 2004; Frest and Johannes 2001; Henderson 1924, 1936; Pilsbry 1948; Squyer 1894; Vanatta 1914.

*Vertigo ovata* - Ovate Vertigo



*Photo by Harry G. Lee*

***Vertigo ovata* Say, 1822    Ovate Vertigo**

**Synonyms:** *Pupa ovata*.

**Subspecies:** *V. o. ovata*.

**Description:** A small snail, to about 1.4 mm diameter and 2.5 mm in height, subovate (pupiform) and tapering, nearly smooth with fine incremental striae, about 5 whorls. Shell coloration is translucent reddish-brown. Aperture subovate, with nine teeth (denticles: angular, parietal, infraparietal, columellar, subcolumellar, suprapalatal, upper palatal, lower palatal, infrapalatal), palatal callus heavy, crest large, sinus deep and sharply inward pointing, lip thin and flared outward.

**Internal Anatomy:** Not described.

**Distribution:** Alaska to Labrador, south to Florida, west to California and Mexico. In Montana, reported on both sides of the Continental Divide from seven counties: Flathead, Lake, Lewis and Clark, Lincoln, Ravalli, Wheatland, Wibaux. Elevation range is 823 to 1468 m (2700 to 4815 ft).

**Habitat:** Edges of marshes, ponds, waterways, in both forested and open sites. Canopy tree species include Engelmann spruce, lodgepole pine, aspen, plains cottonwood, alder, and willow. Found under woody debris, decaying vegetation, leaf litter.

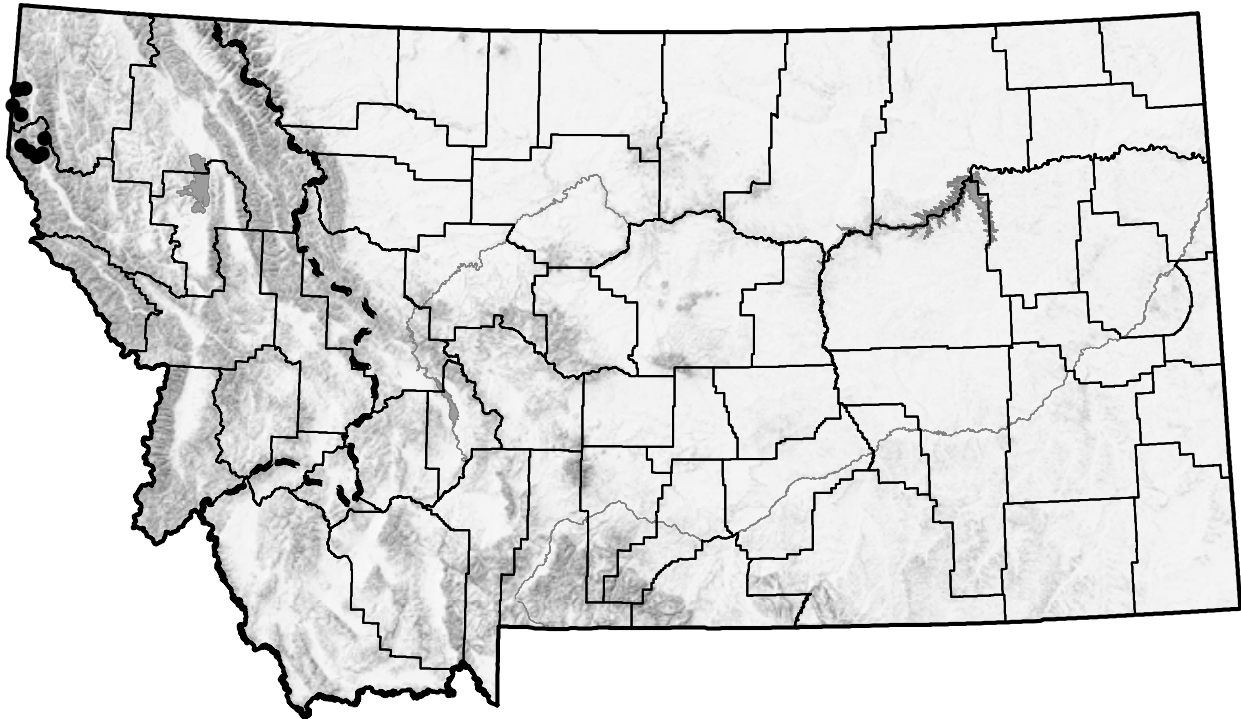
**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Range and habitat in Montana poorly are defined; spotty distribution and marshland habitat indicate possible dispersal via waterfowl. May be common locally; 13 were reported at one Lincoln County site in early October.

**Selected References:** Berry 1916; Forsyth 2004; Frest and Johannes 2001; Pilsbry 1948; Squyer 1894; Vanatta 1914.



*Haplotrema vancouverense* - Robust Lancetooth



*Photo by MTNHP*

***Haplotrema vancouverense* (Lea, 1839)     Robust Lancetooth**

**Synonyms:** *Helix vancouverensis*, *H. vellicata*, *Macrocyclis vancouverensis*, *Circinaria vancouverensis*.

**Subspecies:** None. A dark-brown form, *H. v. chocolata*, described from Alaska and appearing also in western Oregon and Washington, appears to be a color variant within typically-colored populations.

**Description:** A relatively large shell, diameter 20-30 mm and height 8-12 mm. The chitonous or horny shell is a flattened heliciform of up to 5 1/2 whorls, the final portion expanded near the lip, the aperture lip slightly thickened, with the upper margin slightly down-turned. The shell is dull to slightly shiny, yellow to olive-green with low wrinkles and microscopic spiral striae, sometimes with streaks, but no spiral bands. Head, neck, and body are creamy white, the tentacles darker (pale bluish).

**Internal Anatomy:** Pilsbry 1946.

**Distribution:** Aleutian Islands and coastal Alaska south to northwestern California, east to northern Idaho and northwestern Montana. In Montana, 11 records in two counties west of the Continental Divide: Lincoln (5), Sanders (6). Elevation range is 664 to 1140 m (2180 to 3740 ft).

**Habitat:** Mostly in mesic mixed conifer forest, typically near water such as stream-side riparian, seeps and wetlands, sometimes near areas of human activity such as campgrounds. Canopy species include western redcedar, western hemlock, grand fir, Douglas-fir, black cottonwood, paper birch, and a secondary canopy including aspen and alder. Found in leaf litter, under woody debris, rocks, and bryophyte mats.

**Conservation Status:** Montana Species of Concern (G5 S1S2).

**Remarks:** The Idaho and Montana populations may be isolated from the main coastal range of the species. First reported from Montana in 1956; not reported again until 2006. As many as nine individuals were found at two sites in Lincoln County in mid-October.

**Selected References:** Bland and Cooper 1861; Brunson and Osher 1957; Forsyth 2004; Frest and Johannes 2001; Hendricks et al. 2006, 2007; Pilsbry 1946.

*Paralaoma caputspinulae* - Pinhead Spot

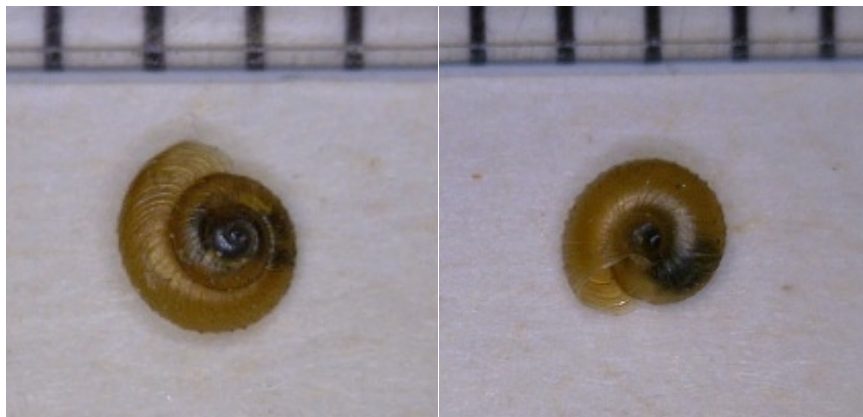
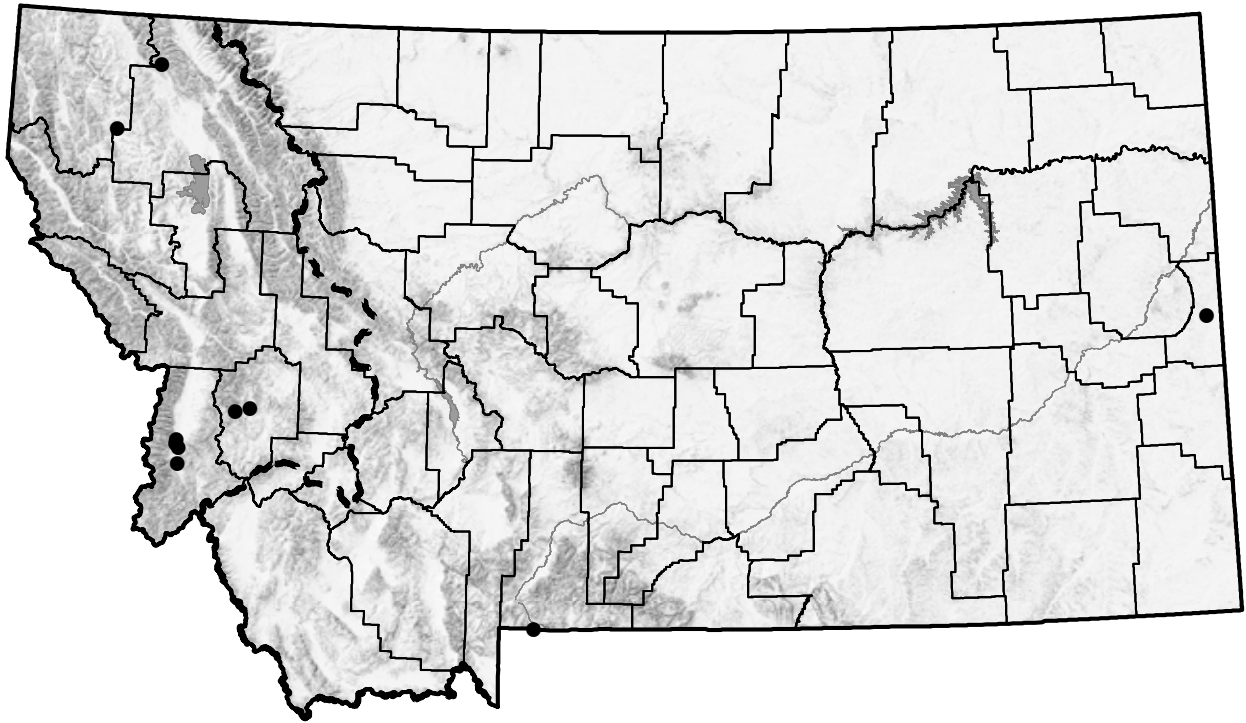


Photo by MTNHP

***Paralaoma caputspinulae* (Reeve, 1852) Pinhead Spot**

**Synonyms:** *Punctum conspectum*, *Pseudohyalina conspecta*, *Helix conspecta*, *Zonites conspectus*.

**Subspecies:** None.

**Description:** A very small shell, to about 2.4 mm diameter but more typically to 2.1 mm, 1.3 mm in height, flattened heliciform with a slightly elevated spire, with barely 4 whorls. Shell is translucent yellowish brown to darker brown, with a series of relatively tall cuticular riblets more or less regularly spaced and with very fine radial and spiral striae between. The aperture is crescent-shaped, obliquely wider than tall, lip not thickened, periphery rounded, umbilicus about 1/4 the shell diameter.

**Internal Anatomy:** Not described.

**Distribution:** Widespread: Eurasia to North Africa, the Americas and Australia; in North America from Alaska south to Mexico. In Montana, reported on both sides of the Continental Divide in five counties, including the extreme east and west; the extreme eastern record from Wibaux County may have been in drift material, other records are from mountainous areas. Elevation range is 823 to 2053 m (2700 to 6735 ft).

**Habitat:** Near moisture, including streamside riparian zones; often disturbed sites. Tree canopy species include Douglas-fir. Found under woody debris and rocks, in leaf litter and duff.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Range and habitat associations in Montana are poorly defined. Two live individuals found were in the Park County, Montana portion of Yellowstone National Park in 2009 (P. Hendricks, pers. obs.) apparently representing a new species for the Park.

**Selected References:** Forsyth 2004; Frest and Johannes 2001; Pilsbry 1948; Squyer 1894; Vanatta 1914.

*Punctum californicum* - Ribbed Spot

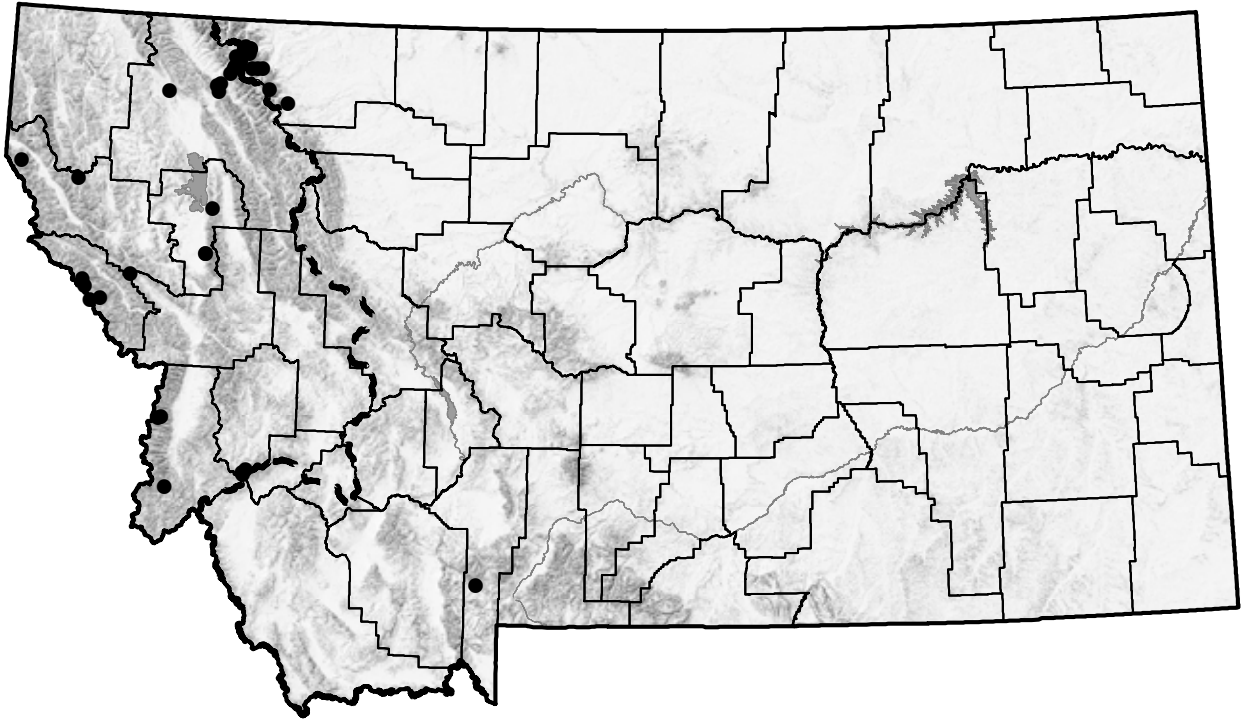


Photo by MTNHP

***Punctum californicum* Pilsbry, 1898   Ribbed Spot**

**Synonyms:** Possibly the same species as *P. randolphi*.

**Subspecies:** None.

**Description:** A very small shell, to 1.8 mm diameter and 1.2 mm in height, flattened heliciform with a moderately-raised spire, with up to 4 1/4 whorls. Shell is translucent yellowish-brown, with a series of small closely-spaced axial riblets on both surfaces; periphery rounded. The aperture is crescent shaped, broader than high; umbilicus is somewhat narrow and deep, about 1/4 the shell diameter. The body is short and barely visible beyond the shell when crawling.

**Internal Anatomy:** Not described.

**Distribution:** Mostly California and Arizona, also Colorado and Montana. In Montana, reported for seven counties, all but one west of the Continental Divide (tentative *P. randolphi* reported for two additional western counties): Flathead, Gallatin, Glacier, Granite, Lake, Mineral, Ravalli. Elevation range is 966 to 2249 m (3170 to 7380 ft).

**Habitat:** Mesic mixed conifer forest. Canopy species include western redcedar, western hemlock, Engelmann spruce, subalpine fir, black cottonwood, western larch and lodgepole pine, secondary canopy includes alder, dogwood and mountain maple. Found under woody debris in leaf litter and duff in moist sites.

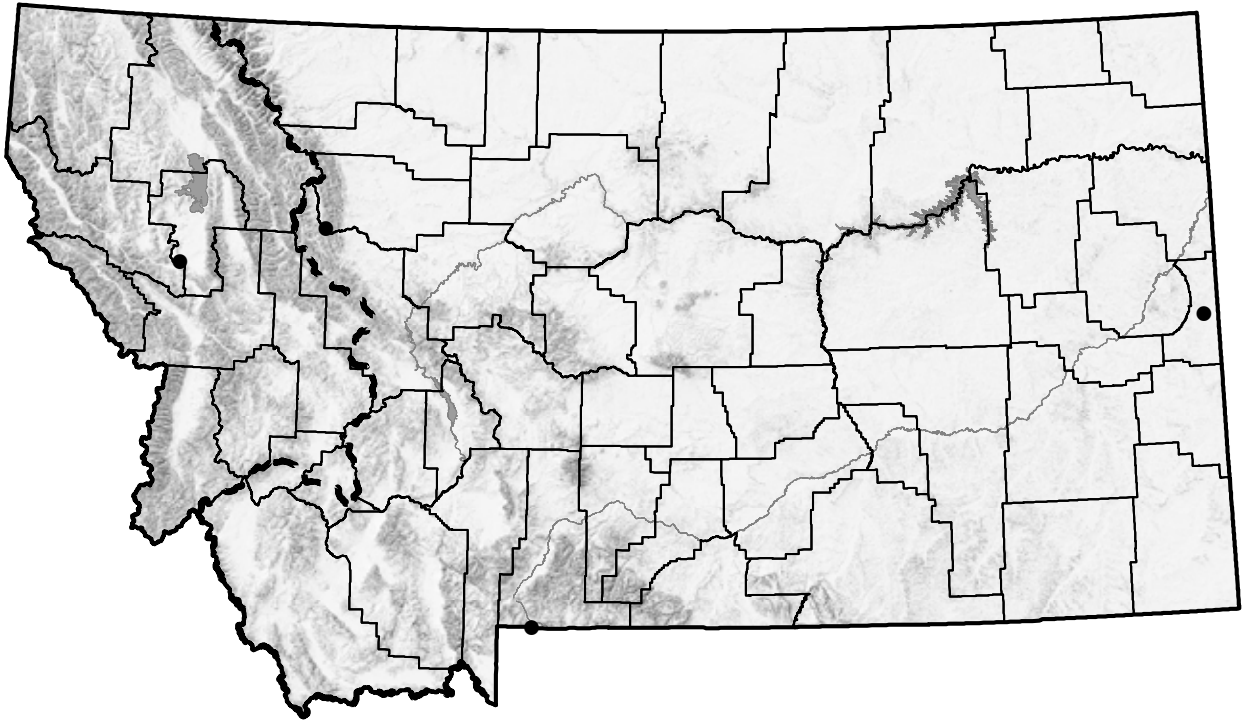
**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** All specimens of *Punctum* in Montana west of the Continental Divide are probably the same species. Usually only a few individuals are encountered, but 30 were reported at one Glacier County site in late August.

**Selected References:** Berry 1919; Forsyth 2004; Hendricks 2009; Pilsbry 1948.



*Punctum minutissimum* - Small Spot



*Photo by Harry G. Lee*



***Punctum minutissimum* (Lea, 1841) Small Spot**

**Synonyms:** *Punctum pygmaeum*.

**Subspecies:** None.

**Description:** A very small shell, to 1.5 mm diameter and usually 0.9 mm in height, flattened-heliciform with a low spire, with about 4 whorls. Shell is yellowish-brown, with a series of small closely-spaced axial riblets on both surfaces; periphery is rounded. The aperture is roundly crescent-shaped; umbilicus is somewhat narrow and deep, about 1/4 to 1/3 the shell diameter.

**Internal Anatomy:** Not described.

**Distribution:** Mostly eastern Canada and the United States, but also to Alberta, Idaho, Oregon, Wyoming, Colorado, and New Mexico. In Montana, reported on both sides of the Continental Divide from four counties: Lake, Park, Teton, Wibaux. Elevation range is 820 to 1975 m (2690 to 6480 ft).

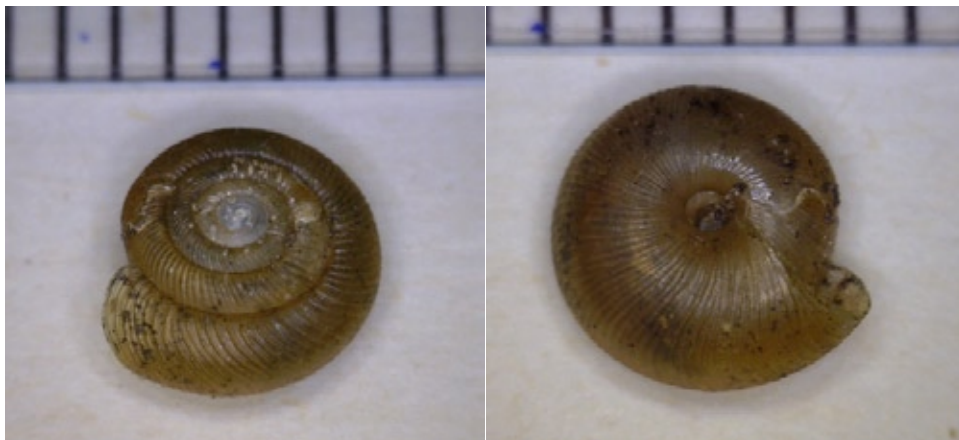
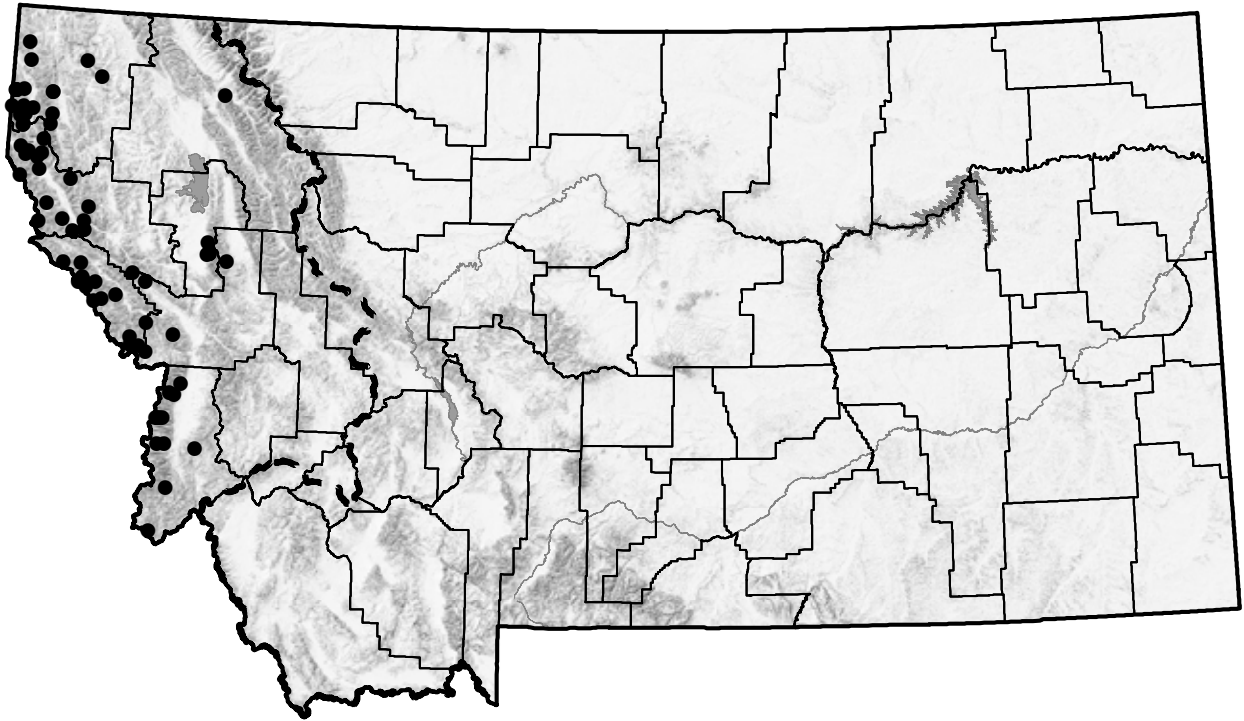
**Habitat:** Forested sites near moisture. Canopy species include aspen and Douglas-fir. Found in moist sites under woody debris and in leaf litter or duff.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** The species disappeared from aspen stands in Yellowstone National Park within six years following stand-replacement fires. Range, abundance and habitat in Montana poorly defined. Eleven live individuals were found at the Park County site in late August.

**Selected References:** Beetle 1961, 1989, 1997; Henderson 1924; Pilsbry 1948; Van Es and Boag 1981.

***Radiodiscus abietum* - Fir Pinwheel**



*Photo by MTNHP*

***Radiodiscus abietum* Baker, 1930    Fir Pinwheel**

**Synonyms:** None.

**Subspecies:** None.

**Description:** A moderately small shell, diameter to about 6.5 mm, height to about 3.5 mm. The chitinous shell is heliciform of up to 5 3/4 whorls, flattened on the upper surface, rounded on the under surface; color is light chocolate-brown and almost opaque. The inner two whorls have fine spiral striae, visible with a hand lens, that abruptly switch to a series of small and closely-spaced but well-defined axial riblets. The umbilicus is deep and relatively narrow, with almost vertical walls, and about 1.0 mm in diameter. The aperture is crescent-shaped and slightly oblique. Head and tentacles are black.

**Internal Anatomy:** Baker 1930; Pilsbry 1948.

**Distribution:** Oregon, Washington, northern Idaho and western Montana. In Montana, 76 records from seven counties west of the Continental Divide: Flathead (1), Lake (7), Lincoln (20), Mineral (13), Missoula (5), Ravalli (12), Sanders (18). Elevation range is 655 to 1939 m (2150 to 6360 ft).

**Habitat:** Found in a variety mixed conifer forests, but usually in moist mesic sites; canopy species include western redcedar, western hemlock, grand fir, western white pine, Douglas-fir, Engelmann spruce, subalpine fir, western larch, ponderosa pine, lodgepole pine, black cottonwood, water and paper birch, with a secondary canopy including aspen, Pacific yew, and alder. Found under woody debris, rocks, leaf litter, and bryophyte mats.

**Conservation Status:** Montana Potential Species of Concern (G4 S3S4).

**Remarks:** First reported from Montana in 1957. May be fairly common locally; as many as 20 were found at one Ravalli County site in late September.

**Selected References:** Baker 1930; Brunson and Russell 1967; Frest and Johannes 1995, 2001; Hendricks et al. 2006, 2007, 2008; Pilsbry 1948; Smith 1943.

*Anguispira kochi* - Banded Tigersnail

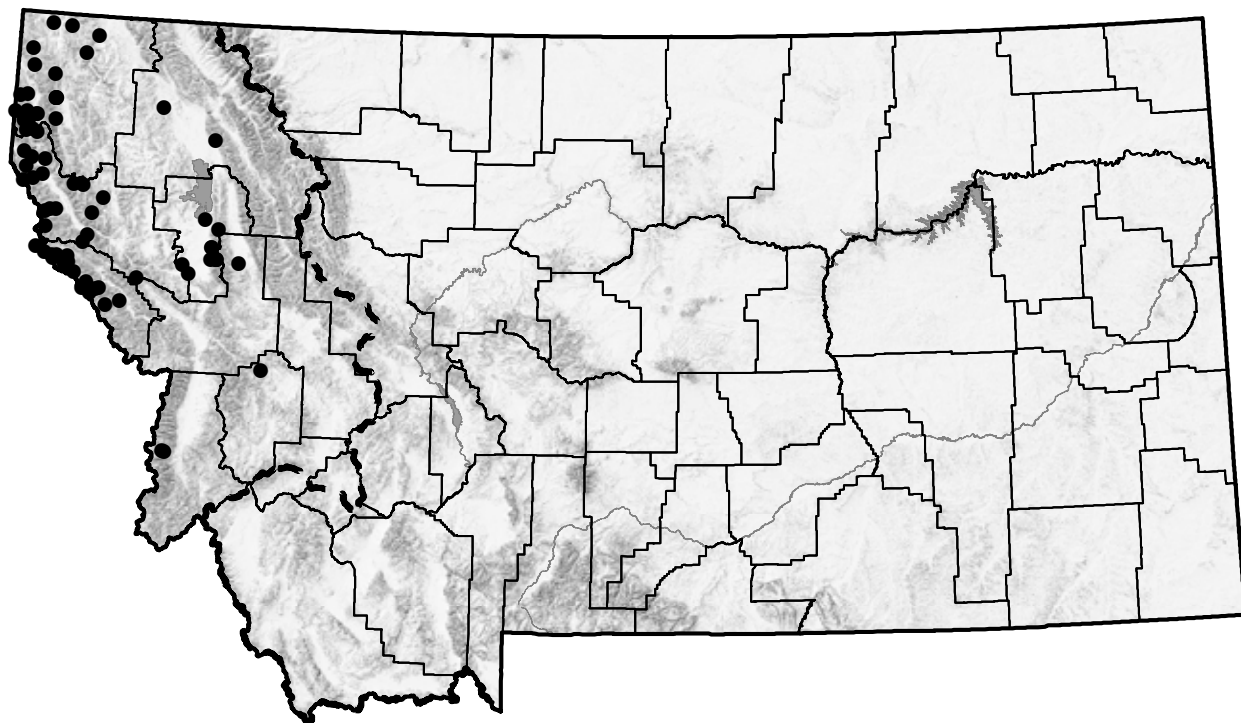


Photo by MTNHP

***Anguispira kochi* (Pfeiffer, 1821)      Banded Tigersnail**

**Synonyms:** *Helix solitaria*, *Patula solitaria*, *Pyramidula solitaria*, *Helix kochi*.

**Subspecies:** *A. k. occidentalis*, but validity questioned.

**Description:** A large shell, to 28 mm in diameter and 22 mm in height, heliciform with up to 6 whorls. Shell is opaque, pale or creamy brown, with a chitinous layer (periostracum) that may become lost with age and wear, the shell appearing grayish or chalky (sometimes difficult to separate from large *Oreohelix*). There is a pale spiral band above the rounded periphery that is bordered by two, and sometimes obscure, reddish-brown bands (in some shells these are visible inside the aperture); the undersurface lacks reddish bands (often present in *Oreohelix* in similar habitat). The shell is covered with a series of low axial riblets; umbilicus is deep, relatively narrow, and not obscured by the aperture lip, aperture round. Head and body are brownish, the tentacles darker.

**Internal Anatomy:** Pilsbry 1948.

**Distribution:** North America from Lake Erie to Kentucky, Arkansas, and Missouri; in the west, southeastern British Columbia to Oregon east of the Cascades, east through Washington and Idaho to northwestern Montana. In Montana, reported from seven counties west of the Continental Divide: Flathead, Lake, Lincoln, Mineral, Missoula, Ravalli, Sanders. Elevation range is 693 to 1625 m (2275 to 5330 ft).

**Habitat:** Mostly in mesic mixed conifer forest, typically near water such as stream-side riparian, and seeps. Canopy species include western redcedar, western hemlock, Engelmann spruce, Douglas-fir, grand fir, western larch, lodgepole pine, black cottonwood and paper birch, and a secondary canopy including alder, dogwood and mountain maple. Found most often under woody debris or rocks in leaf litter and duff.

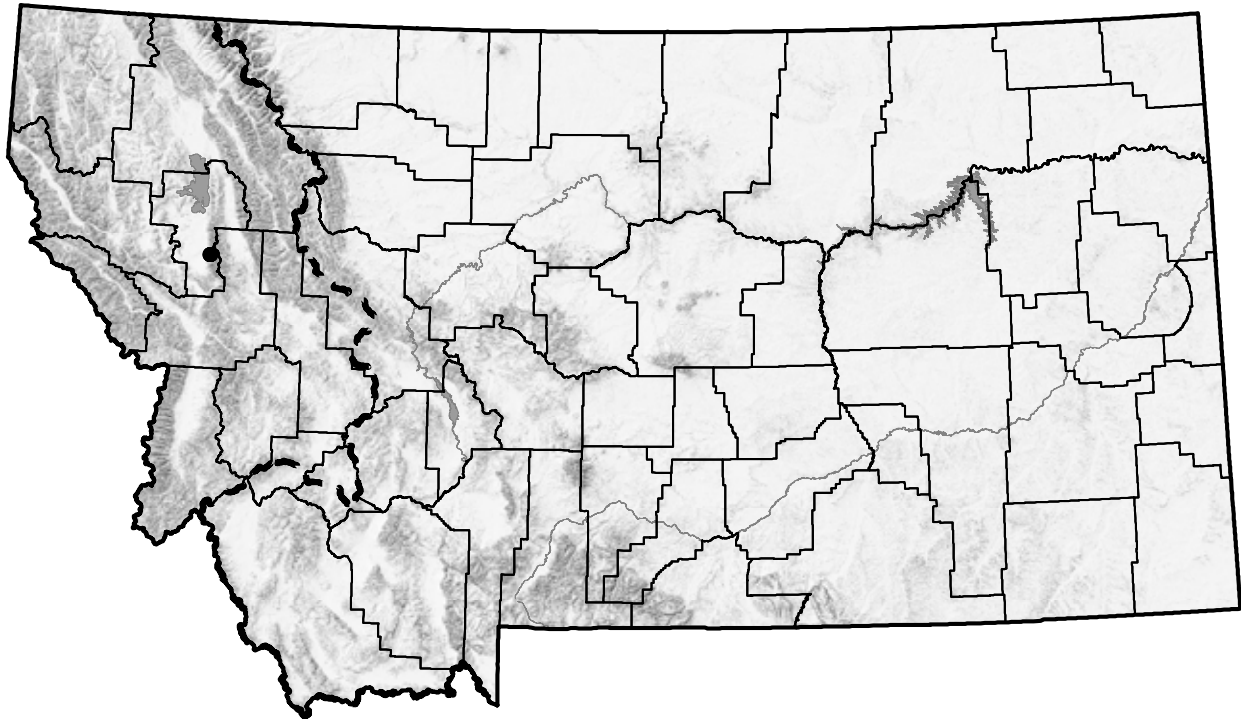
**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** May be abundant at some sites; as many as 55 were reported at one Lincoln County site in early October.

**Selected References:** Bland and Cooper 1861; Elrod 1902; Forsyth 2004; Frest and Johannes 2001; Pilsbry 1948; Smith 1943.



*Discus brunsoni* - Lake Disc



*Photo by MTNHP*

***Discus brunsoni* Berry, 1955    Lake Disc**

**Synonyms:** None.

**Subspecies:** None.

**Description:** The shell is large for the genus, to 10.5 mm diameter, 4.5 mm in height, umbilicus to 3.5 mm diameter, shell depressed in profile with a low spire, to about 5 1/2 compressed whorls with a strongly (but not acutely) carinate periphery. Shell color is olive-brown, the basal surface tends to be a little lighter grayish-brown. There are no spiral bands, but the chitinous shell is wrinkled and weakly ribbed on the upper surface, the irregularities almost absent on the basal surface of adult shells. Dorsal surface of the animal is dark gray to blackish on the head and neck.

**Internal Anatomy:** Not described.

**Distribution:** Endemic to Montana, where its global range as currently known consists of a single boulder/talus slope of about 20000 m<sup>2</sup> in the Mission Mountains, Lake County; there are nine records. Elevation at this site averages 1128 m (3705 ft).

**Habitat:** Described originally as south-facing limestone talus, but reexamination of the rock revealed the occupied slope to be predominately diorite with a minor amount of argillite. The slope lacks canopy cover, except at the margins where Douglas-fir and ponderosa pine occur, with scattered pockets of aspen, water birch, and mock orange.

**Conservation Status:** Montana Species of Concern (G1 S1).

**Remarks:** The original description was based on specimens collected in 1948 and 1950 from slopes above McDonald Lake. This species appears to make vertical migrations through deep talus and boulder fields, making it all the more difficult to locate except under ideal moisture and temperature conditions. As many as 39 individuals were found at this site during a single visit in early June; last reported in 1997.

**Selected References:** Berry 1955; Brunson 1956; Frest and Johannes 1995; Hendricks 1998.



*Discus shimekii* - Striate Disc

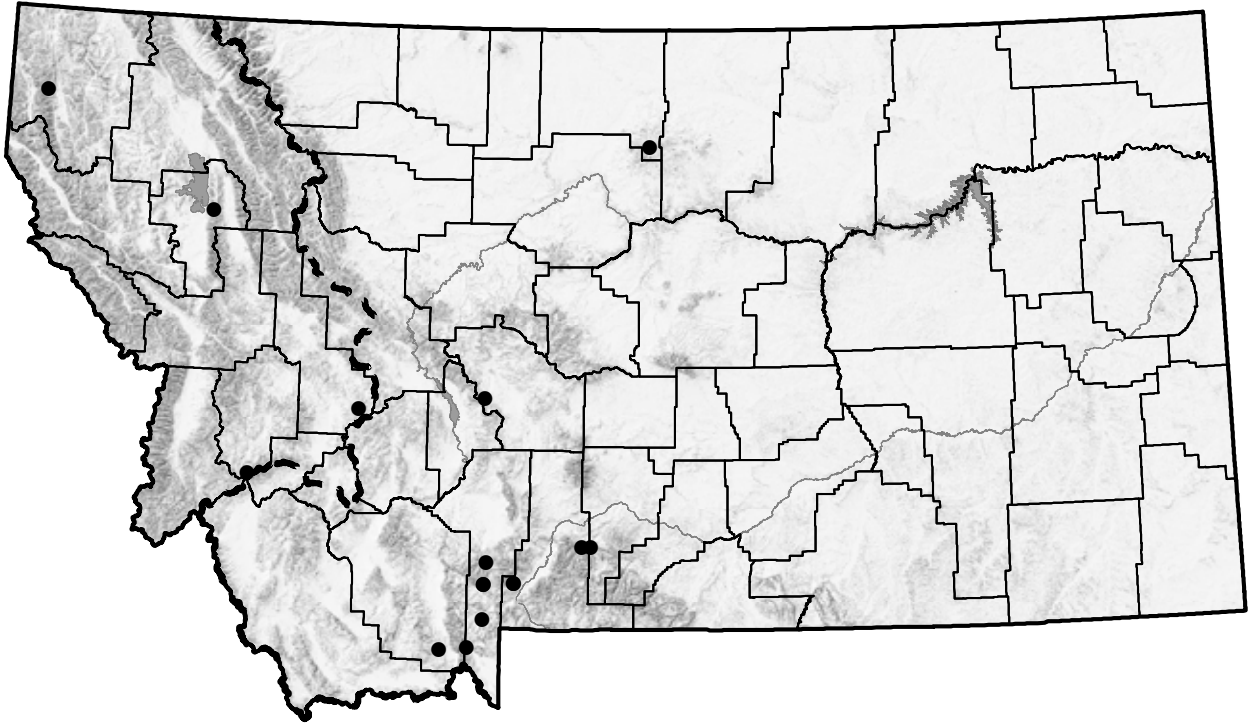


Photo by MTNHP

***Discus shimekii* (Pilsbry, 1890)    Striate Disc**

**Synonyms:** *Zonites shimekii*, *Pyramidula shimekii*, *P. cockerelli*, *Zonitoides randolphi*.

**Subspecies:** *D. s. cockerelli*; subspecies validity is questionable.

**Description:** A small shell, to 6.5 mm diameter, 4 mm in height, flattened heliciform, with up to 4 1/2 whorls. Shell is translucent brown to yellowish-brown, the inner 1 1/2 whorls smooth, later whorls with prominent axial ribs on the upper surface which rarely extend below the periphery to the underside, the periphery rounded. Aperture lip is rounded not angular, nor thickened or flared; umbilicus about 1/4 the diameter.

**Internal Anatomy:** Not described.

**Distribution:** Yukon south to California and Arizona, east to Alberta and south through Wyoming, South Dakota (Black Hills), Utah, Colorado, and New Mexico. In Montana, 16 records from 10 counties on both sides of the Continental Divide: Gallatin (5), Granite (1), Hill (1), Lake (1), Lincoln (1), Madison (1), Meagher (1), Park (3), Powell (1), Sweet Grass (1). Elevation range is 997 to 2099 m (3270 to 6885 ft).

**Habitat:** Montane forests, often with a mixed conifer canopy including Engelmann spruce, subalpine fir, Douglas-fir, lodgepole pine and aspen with a secondary canopy of alder; also in riparian aspen stands or pockets of aspen. Found under woody debris and rocks, in leaf litter and duff.

**Conservation Status:** Montana Species of Concern (G5 S1).

**Remarks:** May occur in northern Idaho, but no records have been confirmed; first reported from Montana in 1923. Apparently more localized in its distribution than *Discus whitneyi*; as many as eight live individuals were found at one site in Meagher County in mid-September.

**Selected References:** Beetle 1957, 1961; Forsyth 2004; Henderson 1924; Hendricks et al. 2007; Pilsbry 1948.

*Discus whitneyi* - Forest Disc

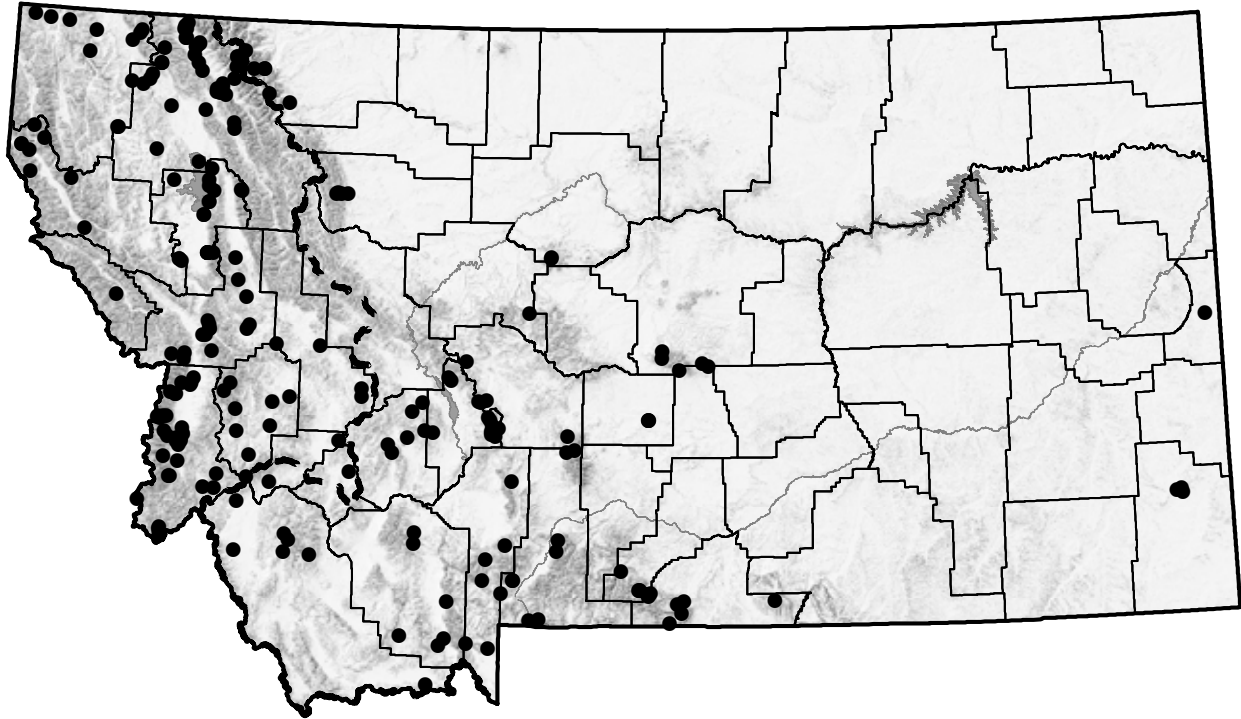


Photo by MTNHP

***Discus whitneyi* (Newcomb, 1865) Forest Disc**

**Synonyms:** *Discus cronkhitei*, *Helix striatella*, *H. whitneyi*, *H. cronkhitei*, *Pyramidula cronkhitei*.

**Subspecies:** None.

**Description:** A small shell, to about 6.5 mm diameter but usually smaller, to about 3.5 mm in height, flattened heliciform, with up to 4 1/2 whorls. Shell is translucent brown to dark brown, the inner 1 1/2 whorls are smooth, later whorls with prominent evenly-spaced axial ribs on both upper and lower surfaces, the periphery sometimes rounded, sometimes angular. Aperture lip is oval to angular and not thickened or flared, the umbilicus wide, about 1/3 the diameter. The animal is pale gray on the sides and tail, darker to blackish on the head, neck, and tentacles.

**Internal Anatomy:** Not described.

**Distribution:** Across Alaska and Canada south to California, New Mexico, Texas and Kentucky. In Montana, reported across the state from 26 counties on both sides of the Continental Divide. Elevation range is 655 to 2582 m (2150 to 8470 ft)

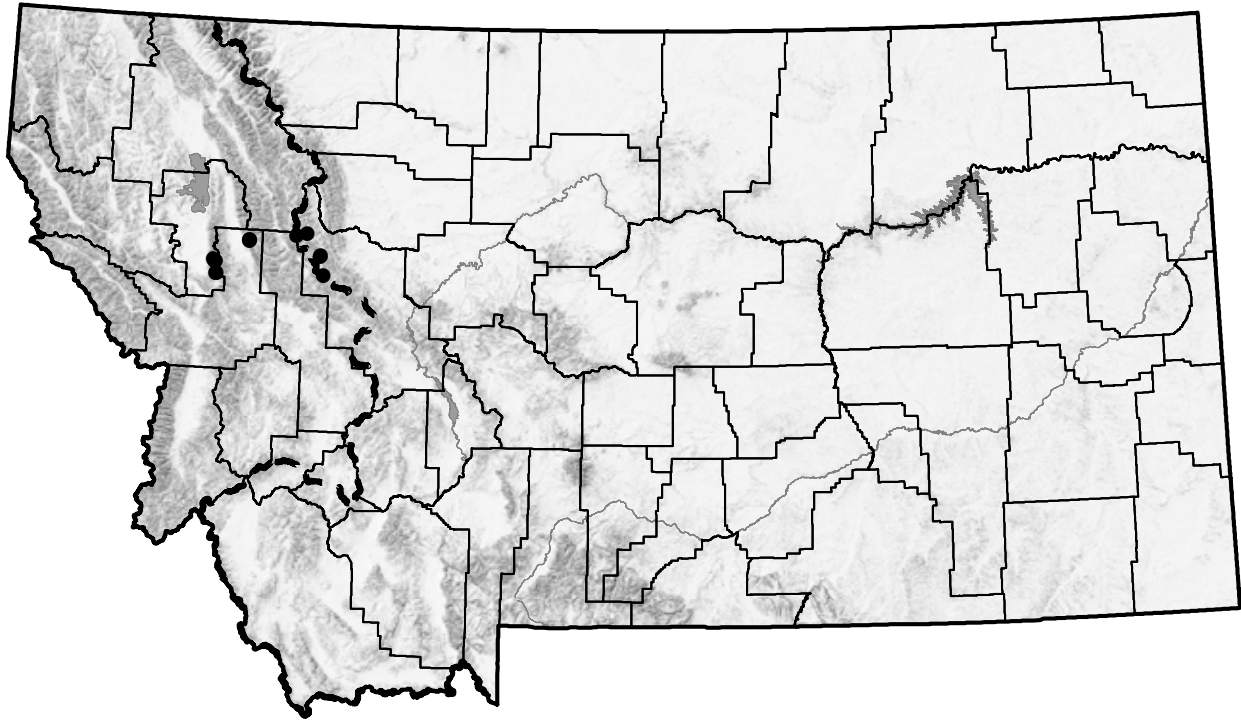
**Habitat:** Forested habitats, from mesic (western redcedar, western hemlock, Engelmann spruce, Douglas-fir, black cottonwood, secondary canopy including alder, Pacific yew, paper birch, mountain maple, dogwood, willow) to relatively dry (ponderosa pine and Rocky Mountain juniper, but usually in moister sites, such as imbedded pockets of aspen). Found under woody debris and rocks, in downed rotten wood, leaf litter and duff.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Perhaps the most common and wide-spread disc in Montana. May be locally abundant; 62 live animals were observed at one Flathead County site in mid-October.

**Selected References:** Beetle 1957, 1961; Forsyth 2004; Frest and Johannes 2001; Hendricks 2009; Pilsbry 1948; Russell and Brunson 1967.

***Oreohelix alpina* - Alpine Mountainsnail**



*Photo by MTNHP*

***Oreohelix alpina* (Elrod, 1901)    Alpine Mountainsnail**

**Synonyms:** *Pyramidula strigosa alpina*, *Pyramidula strigosa montana*.

**Subspecies:** None.

**Description:** The shell is small, to 12 mm diameter but usually less than 10 mm (new-born young about 2 mm diameter), to 7 mm in height but usually less than 5 mm; heliciform with up to 4 1/2 whorls, depressed somewhat in profile with a low spire, umbilicus narrow and deep, aperture oval to nearly circular, periphery rounded or slightly carinate. Shell opaque and chalky, color is brownish-gray (dead shells to pearly white), with a series of reddish-brown spiral bands, two or more on the upper surface, a prominent band near the periphery on the lower surface, and one or more paler bands below that; bands may be evident on penultimate whorl, or may be very pale or absent entirely, probably from abrasion and exposure to sunlight. Smaller shells may have a brownish cuticle that is lost in larger individuals. Head, neck, and tentacles dark brown, darker than the shell. In the field best identified based upon a combination of size, location, and habitat.

**Internal Anatomy:** Fairbanks 2002.

**Distribution:** Endemic to northwestern Montana. In Montana, 11 records from six sites in four counties west of, or near, the Continental Divide: Lake (5), Lewis and Clark (2), Missoula (3), Powell (1). Elevation range is 2195 to 2957 m (7200 to 9700 ft).

**Habitat:** Limestone talus at and above tree line. Tree canopy absent or minimal; canopy species where present include scattered whitebark pine, Engelmann spruce, and subalpine fir. Ground cover also minimal, but includes scattered dwarf willow, snow cinquefoil, alpine sorrel, mountain avens, stonecrop and moss campion. Live animals occur mostly under rocks and in duff or soil accumulations under rocks, sun-bleached shells may be found on the surface.

**Conservation Status:** Montana Species of Concern (G1 S1).

**Remarks:** The original description is based on specimens collected in 1900 above tree line on the southwest ridge of “Sin-yale-a-min [Sinyaleamin] Peak” known today as East St. Marys Peak near the southern end of the Mission Mountains, Lake County. Populations in the Mission Mountains are probably completely isolated from those in the Bob Marshall/Scapegoat Wilderness complex. Sometimes locally abundant; as many as 160 (live and shells) were observed at one site in Lewis and Clark County in late July.

**Selected References:** Elrod 1901b, 1902, 1903b; Fairbanks 2002; Frest and Johannes 1995; Hendricks 1998; Pilsbry 1939; Schaack and Stickney 1981.



*Oreohelix amariradix* - Bitterroot Mountainsnail

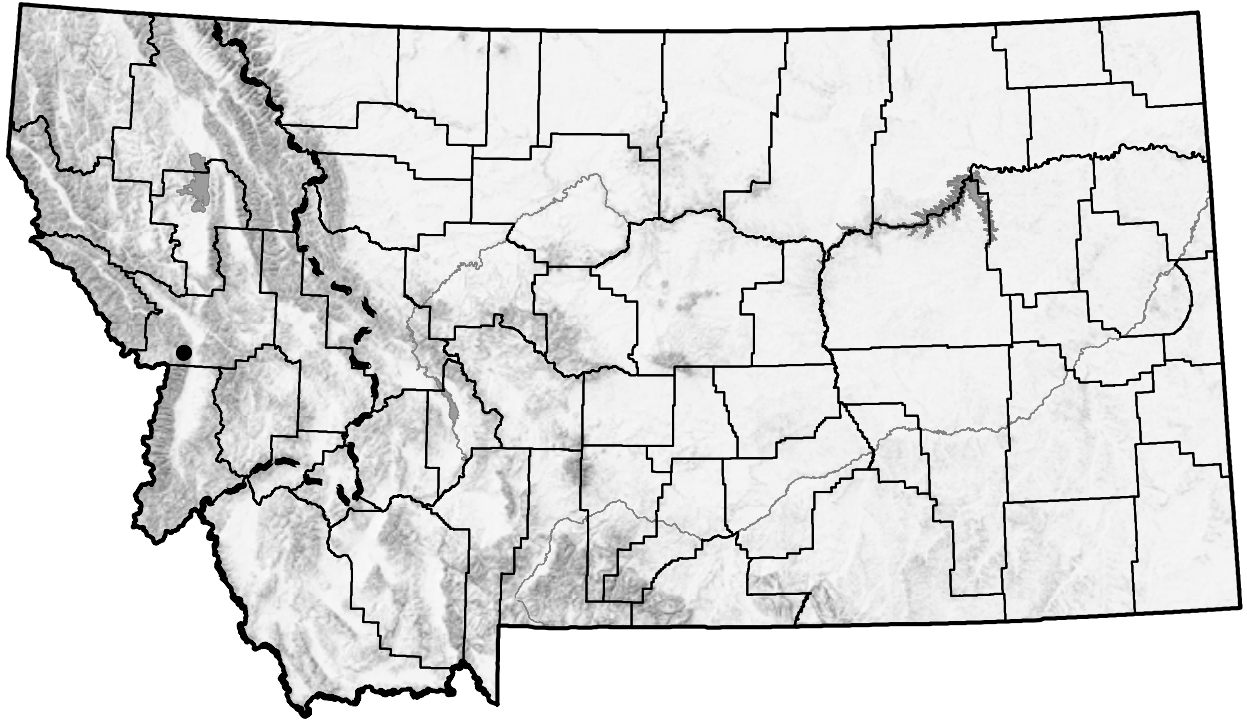


Photo by MTNHP



***Oreohelix amariradix* Pilsbry, 1934      Bitterroot Mountainsnail**

**Synonyms:** *Pyramidula strigosa* var.

**Subspecies:** None.

**Description:** A medium-sized shell, adults to about 16 mm diameter and 9 mm in height, neonates 2.5 to 3.4 mm diameter; somewhat flattened heliciform with up to 5 1/3 whorls in adults, 2 to 2 1/3 whorls in neonates; the last whorl of adults descends in front. Whorls somewhat rough textured with irregular axial riblets and striae. Umbilicus narrow (contained about 4 times in diameter) and deep, aperture rather strongly oblique or ovate and not thickened, periphery sharply angular though more rounded nearer the aperture. Shell opaque and chalky, color is brownish-gray (sun-bleached shells to pearly white), with a reddish-brown spiral band above and below the periphery, although number of bands may be variable. Smaller shells may have a brownish cuticle that is lost in larger individuals; soft parts of live animals not described. In the field best identified based upon a combination of size, form, location and habitat.

**Internal Anatomy:** Fairbanks 1980.

**Distribution:** Endemic to northwestern Montana. In Montana, eight records from at least three sites, all west of the Continental Divide in Missoula County, and all near Fort Fizzle. Elevation range is 1052 to 1399 m (3450 to 4590 ft).

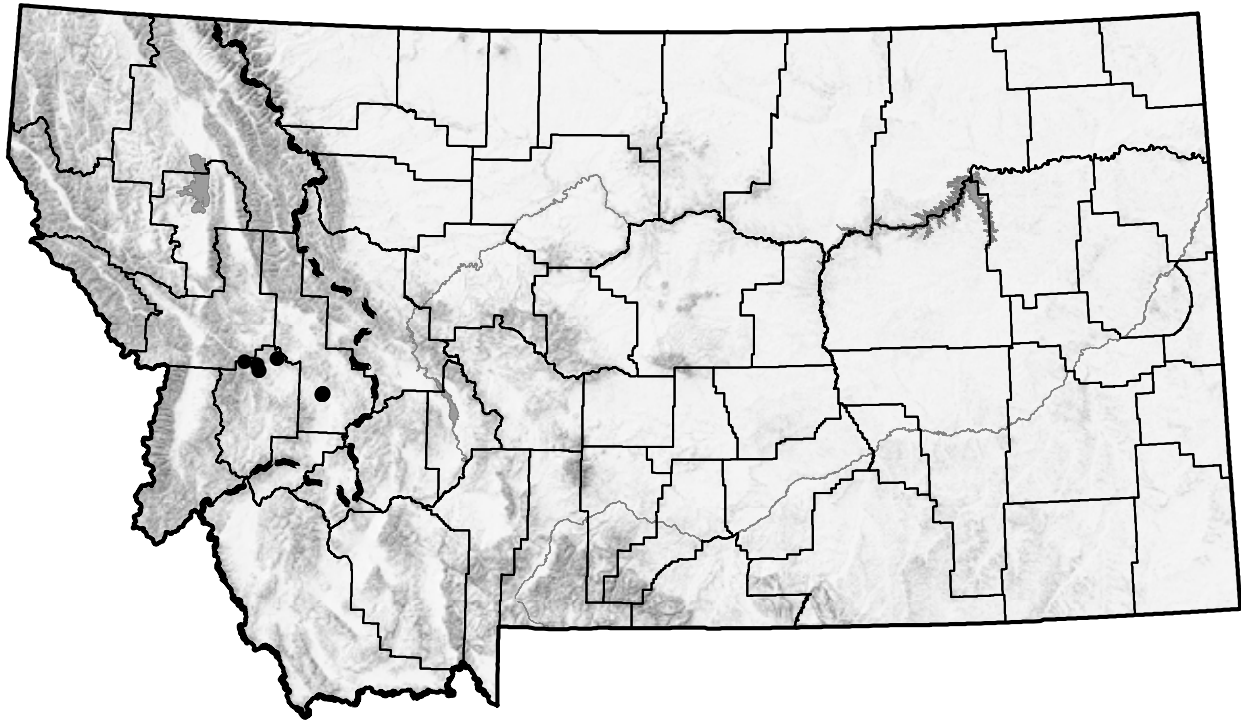
**Habitat:** Grassy south-facing slopes. Tree canopy, where present, includes scattered ponderosa pine. Understory cover includes scattered serviceberry, ninebark, and bunch grasses. Live animals present mostly in small talus slides under rocks and in duff or soil accumulations.

**Conservation Status:** Montana Species of Concern (G1G2 S1S2).

**Remarks:** The original description is based on specimens collected in 1897 and 1902 by Morton J. Elrod in the Lolo Creek drainage of the Bitterroot Mountains. Sometimes moderately abundant; as many as 21 (live and shells) were seen at one site in Missoula County in late May. Some sites have experienced intense fire since 2000 and need to be revisited to determine if viable populations still exist. Range, abundance, and habitat poorly defined; current status needs investigation.

**Selected References:** Elrod 1902; Fairbanks 1980; Frest and Johannes 1995; Henderson 1936; Hendricks 2003; Pilsbry 1934, 1939.

***Oreohelix carinifera* - Keeled Mountainsnail**



*Photo by MTNHP*

***Oreohelix carinifera* Pilsbry, 1912**

**Keeled Mountainsnail**

**Synonyms:** None.

**Subspecies:** None.

**Description:** The shell is small, to 12.5 mm diameter and 7 mm in height; flattened heliciform with up to 5 whorls, umbilicus narrow and deep (contained about 4 1/2 times in the diameter), aperture oval to nearly circular, periphery strongly carinate or keeled. The surface is with coarse wrinkles but few spiral striae, the last whorl descends slightly or not at all to the aperture. Shell opaque and chalky, color is brownish-gray (dead shells to pearly white), with a series of reddish-brown spiral bands, that may be very pale or absent entirely, probably from abrasion and exposure to sunlight. Smaller shells may have a brownish cuticle that is lost in larger individuals. Head, neck, and tentacles are grayish-brown, darker than the shell. In the field best identified based upon a combination of size, location and habitat.

**Internal Anatomy:** Pilsbry 1934, 1939.

**Distribution:** Endemic to northwestern Montana. In Montana, 14 records from five sites in three counties west of the Continental Divide: Granite (3), Missoula (1), Powell (1). Elevation range is 1224 to 1715 m (4015 to 5625 ft).

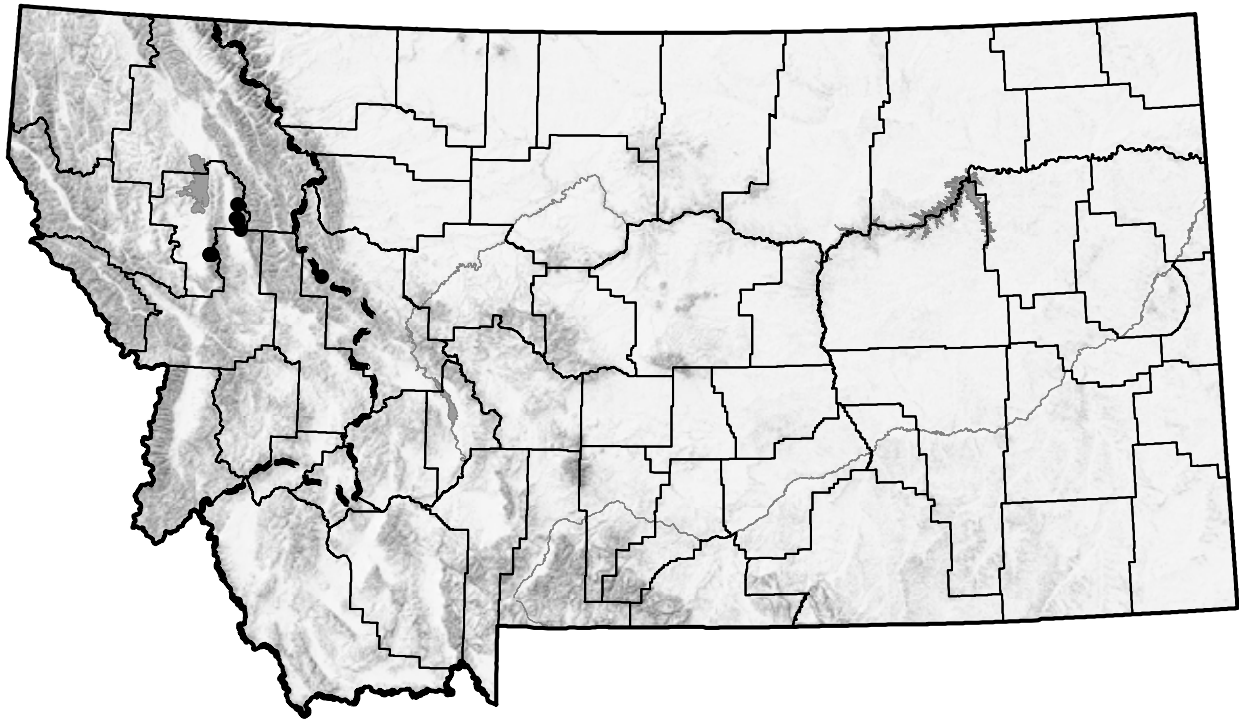
**Habitat:** Often associated with south-facing limestone talus and rocks, sometimes under an open tree canopy in relatively dry sites. Tree canopy includes Rocky Mountain juniper, ponderosa pine, and Douglas-fir. Ground cover varies but includes scattered sagebrush, Oregon grape, balsamroot, and bunch grasses. Live animals present mostly under shrubs, prostrate limbs of low-stature trees, rocks, and in duff or soil accumulations under some form of cover; sun-bleached shells may be found under rocks or on the surface.

**Conservation Status:** Montana Species of Concern (G1 S1).

**Remarks:** The original description was based on specimens collected in 1907 and 1909 at Garrison Junction, Powell County. All known localities are in the Upper Clark Fork River drainage, mostly in the corridor between Garrison Junction to Beavertail Hill State Park. Dorothy Beetle retracted her report from the Big Horn Mountains of Wyoming as a misidentification of *Oreohelix yavapai*, although the one remaining report from east of the Divide in Park County, Wyoming needs verification. Sometimes locally abundant; as many as 140 (live and shells) were found at one site in Granite County in mid May. Range, abundance, and status still poorly defined; current status needs investigation.

**Selected References:** Beetle 1961, 1987, 1989; Frest and Johannes 1995; Hendricks 2003; Pilsbry 1912, 1934, 1939.

***Oreohelix elrodi* - Carinate Mountainsnail**



*Photo by MTNHP*

***Oreohelix elrodi* (Pilsbry, 1900)    Carinate Mountainsnail**

**Synonyms:** *Pyramidula elrodi*.

**Subspecies:** None.

**Description:** The shell is large, to 28 mm diameter, height to 13 mm, but usually about 22 mm in diameter and 10 mm in height, heliciform with up to 5 to 5 1/2 whorls (new-born young about 3.5 mm in diameter, with 2 to 2 1/2 whorls), strongly depressed with a low spire, acutely carinate, with an open umbilicus to 6 mm diameter. Shell opaque and chalky, color is pale grayish to nearly white, sometimes with a very pale pinkish undertone; smaller shells may have a brownish cuticle that is lost in mature individuals. Inner (embryonic) whorls smooth then unevenly striate, later whorls lack spiral bands and are coarsely and irregularly ribbed on upper and lower surfaces, the last whorl descending somewhat to the aperture; the aperture is angular at the keeled periphery. Description for an alpine population on the Scapegoat Plateau is much as above except the shells are much smaller, to 15 mm diameter, 6.5 mm in height, and 4 1/2 whorls, but usually 10.5 mm diameter, 5 mm in height, and 4 whorls or less.

**Internal Anatomy:** Fairbanks 1984; Pilsbry 1939.

**Distribution:** Edemic to northwestern Montana. In Montana, 29 records from five sites in two counties west of, or near, the Continental Divide: Lake (28), Lewis and Clark (1). Elevation range is 1097 to 2438 m (3600 to 8000 ft).

**Habitat:** Described originally as exposed limestone talus below tree line, but examination of the rock at four of five sites revealed they are predominantly argillite, sometimes with diorite or minor amounts of limestone. Occupied sub-alpine talus sites may lack forest canopy altogether or occur under an open mixed conifer canopy including Douglas-fir, western larch, ponderosa pine, western redcedar (near streams), with aspen, paper birch and mock orange scattered along the margins of talus slopes. The exception is an expanse of limestone well above tree line on the Scapegoat Plateau. Live animals present mostly within the talus under or on rocks, or in accumulations of duff within the talus.

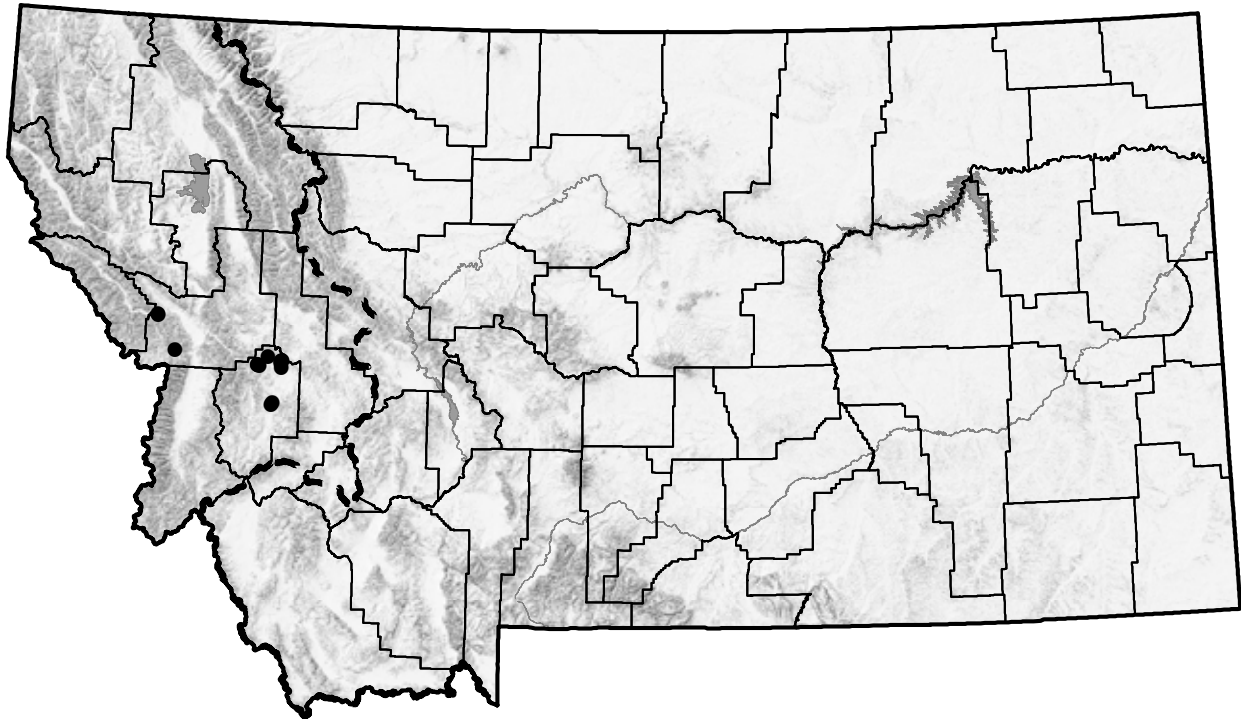
**Conservation Status:** Montana Species of Concern (G1 S1).

**Remarks:** The original description was based on specimens collected in 1899 from slopes above McDonald Lake in the Mission Mountains, Lake County. Animals from the Scapegoat Plateau, Lewis and Clark County may be an undescribed subspecies or entirely different species. Populations in the Mission Mountains are probably isolated from those in the Scapegoat Plateau and Swan Range. Sometimes locally abundant; as many as 100 live animals and 400 shells were seen at the Lewis and Clark County site in late July.

**Selected References:** Elrod 1901b, 1902, 1903a; Fairbanks 1984; Frest and Johannes 1995; Hendricks 1998; Hendricks et al. 2008; Pilsbry 1900, 1939.



***Oreohelix haydeni* - Lyrate Mountainsnail**



*Photo by MTNHP*

***Oreohelix haydeni* (Gabb, 1869)**

**Lyrate Mountainsnail**

**Synonyms:** *Helix haydeni*, *Patula haydeni*, *Patula strigosa haydeni*, *Pyramidula haydeni*.

**Subspecies:** *O. h. hesperia*, *O. h. hybrida*, and *O. h. perplexa* in Idaho; *O. h. oquirrhensis* and *O. h. bruneri* in Montana.

**Description:** A distinctive medium to large-sized shell, to 22 mm diameter and 13 mm in height but usually smaller; flattened-heliciform, depressed somewhat in profile, with up to 5 3/4 whorls. Late whorls have coarse irregular striae and prominent raised spiral cords or lirae on both upper and lower surfaces (up to 5 above and 11 below the periphery). The umbilicus is narrow and deep (contained about 5 times in the diameter). The aperture is oval, periphery with a keel. Shell opaque and chalky, color is brownish-gray (dead shells to pearly white); Montana shells lack reddish-brown spiral bands often present in most other species of *Oreohelix*. Head, neck and tentacles dull ashy gray, darker than the shell.

**Internal Anatomy:** Fairbanks 1975; Pilsbry 1939.

**Distribution:** Northern Idaho and northwestern Montana south to Utah and northwestern Colorado. In Montana, 16 records from 11 sites in three counties west of the Continental Divide: Granite (13), Mineral (2), Missoula (1). Elevation range is 1033 to 1716 m (3390 to 5630 ft).

**Habitat:** Often associated with limestone talus and outcrops, sometimes with minimal tree canopy cover on steep south-facing slopes, although at least one site is north-facing. Primary canopy species include Douglas-fir, ponderosa pine, mountain maple; secondary canopy cover may include aspen, ninebark, and serviceberry. Live animals present mostly under rocks and in duff or soil accumulations under rocks, sun-bleached shells may be found on the surface.

**Conservation Status:** Montana Species of Concern (G2G3 S1S3).

**Remarks:** The description of *O. h. bruneri* is based on shells from an unknown location in Montana and may not be valid; the material is apparently lost. Lee Fairbanks felt that two of the four populations he studied in western Montana might be distinct at the subspecific level. With additional study, Montana *Oreohelix haydeni* may prove to be undescribed species. Included here are *Oreohelix* n. sp. 6 and n. sp. 31 of Terry Frest and Edward Johannes. *Oreohelix* n. sp. 31 is considered by Frest and Johannes to be incorrectly attributed to *O. h. oquirrhensis*. May be relatively abundant at some sites; 66 live animals were collected at the Missoula County site in mid June. Range, abundance, and status in Montana still poorly defined; current status needs investigation.

**Selected References:** Fairbanks 1975; Frest and Johannes 1995, 2001; Henderson 1936; Pilsbry 1939.



*Oreohelix pygmaea* - Pygmy Mountainsnail

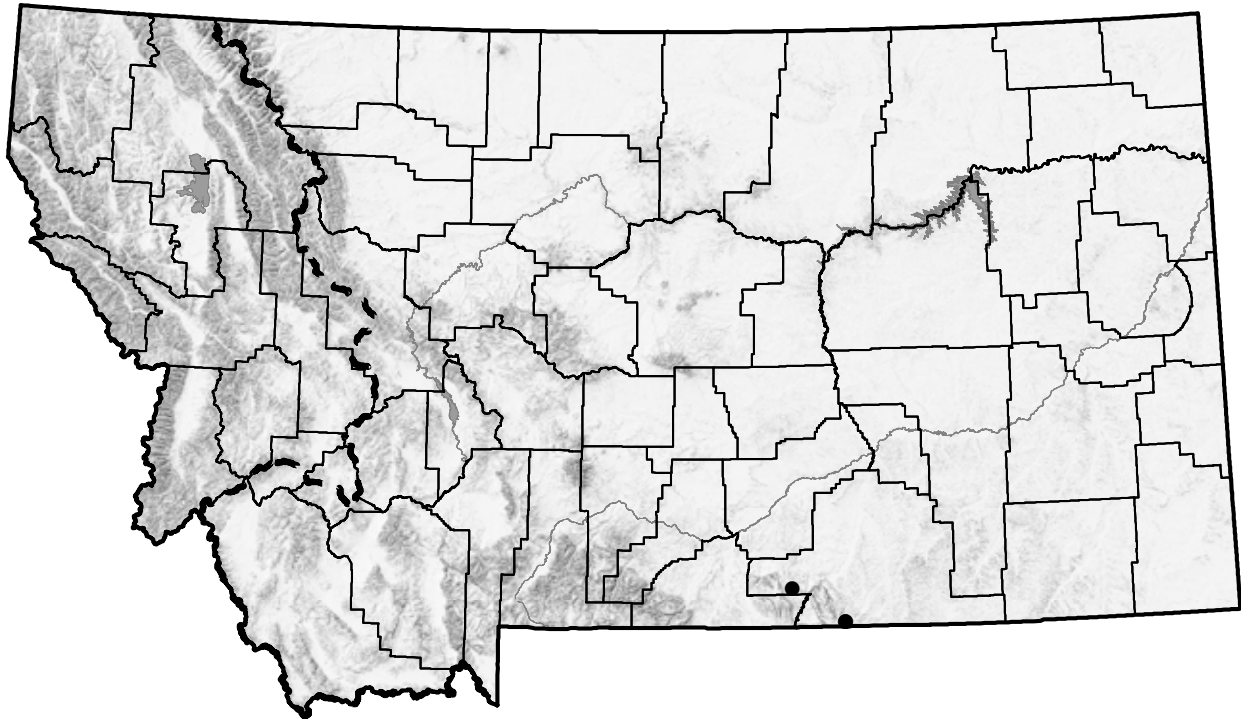


Photo by MTNHP

***Oreohelix pygmaea* Pilsbry, 1913**

**Pygmy Mountainsnail**

**Synonyms:** *Oreohelix maculata*.

**Subspecies:** None.

**Description:** The shell is small to medium, to about 15 mm diameter but usually less than 12 mm, and to 14 mm in height, but usually less than 9 mm (ratio of height to diameter 0.67 – 0.81); heliciform with up to 5 1/2 whorls, high-spired in profile, umbilicus narrow and deep, aperture oval, periphery rounded. Shell opaque and chalky, color is brown to fleshy, sometimes chocolate brown on the base (dead sun-bleached shells whitish), with a series of reddish-brown spiral bands, two on the upper surface, a prominent band near the periphery on the lower surface, up to four thinner bands (sometimes none) on the lower surface. Smaller shells may have a brownish cuticle that is lost in larger individuals. Surface is irregularly wrinkled with weak to moderate spiral impressed lines. Suture is deeply impressed on the last whorl. In the field, best identified based upon a combination of size, location and habitat.

**Internal Anatomy:** Pilsbry 1939.

**Distribution:** Northwestern Wyoming and adjacent south-central Montana. In Montana, two records from two sites east of the Continental Divide in Big Horn County. Elevation range is 1451 to 2006 m (4760 to 6580 ft).

**Habitat:** Limestone and sandstone talus, adjacent moist meadows and creek bottoms. Tree canopy species where present include scattered cottonwood, aspen, willow, Douglas-fir, ponderosa pine, juniper, and mountain mahogany. Live animals present mostly under rocks and in duff or soil accumulations under rocks, sun-bleached shells may be found on the surface.

**Conservation Status:** Montana Species of Concern (G1 S1).

**Remarks:** Dorothy Beetle considered *Oreohelix strigosa berryi* to be a small form of *O. pygmaea*. Range, abundance, and habitat poorly defined in Montana; current status needs investigation. Probably also occurs in Carbon County, especially in and around the Pryor Mountains.

**Selected References:** Beetle 1961, 1987, 1989; Pilsbry 1939.

*Oreohelix strigosa* - Rocky Mountainsnail

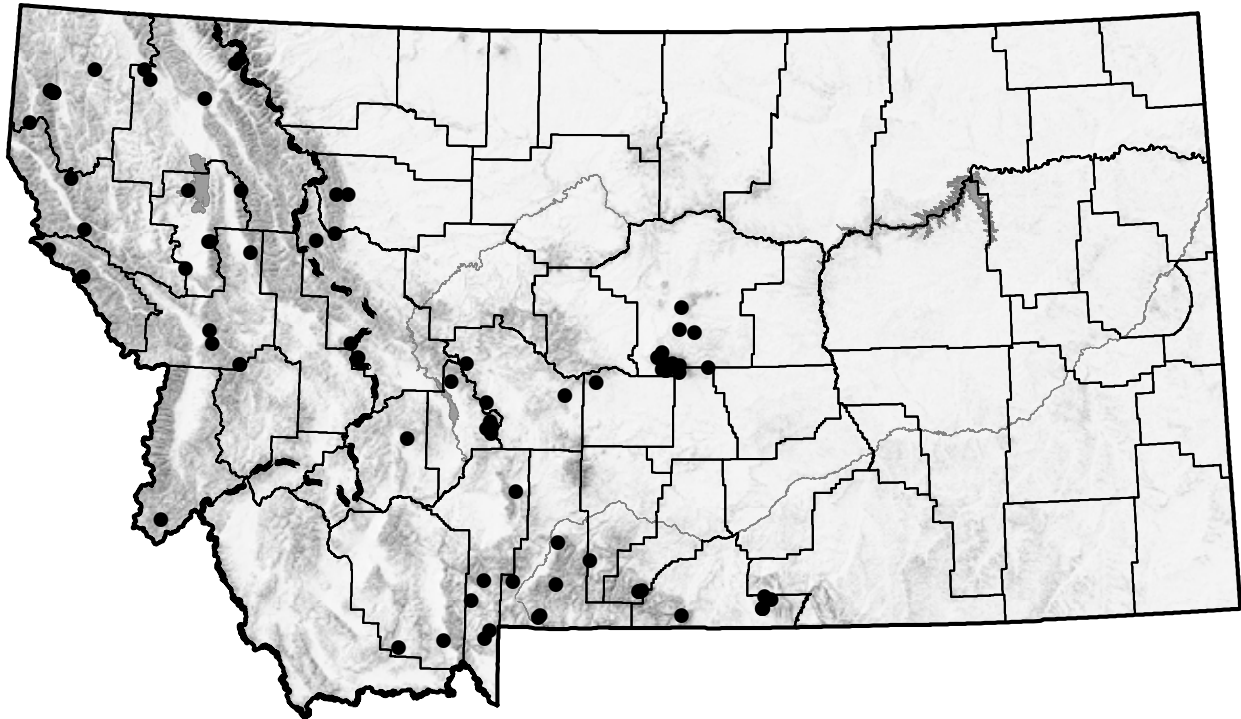


Photo by MTNHP

***Oreohelix strigosa* (Gould, 1946)**

**Rocky Mountainsnail**

**Synonyms:** *Helix strigosa*, *Patula strigosa*.

**Subspecies:** *O. s. capex*, *O. s. fragilis* and *O. s. goniogyra* in Idaho only; *O. s. berryi* and *O. s. cooperi* in Montana only; *O. s. strigosa* and *O. s. depressa* in both states.

**Description:** Highly variable in form. Medium-sized to large, the shell diameter ranges from 9 to 28 mm, depending on subspecies, but usually more than 15 mm (new-born young about 3 mm diameter), and from 6 to 18 mm in height but usually less than 14 mm. Typically flattened heliciform, with 4 1/3 to 5 3/4 whorls, but varies from elevated to depressed in profile; the periphery is weakly to sharply angular. Umbilicus is relatively broad and deep, the aperture ovate to rounded, lip barely thickened inside. Shell opaque and chalky, color is grayish (dead shells to pearly white), with a series of reddish-brown spiral bands, typically one on the upper surface and another just below the periphery, sometimes with one or more fainter bands below that; bands may be evident on penultimate whorl, or may be very pale or absent entirely, probably from abrasion and exposure to sunlight. Shell surface with coarse, irregular axial riblets and striae, sometimes with faint spiral sculpting as well.

**Internal Anatomy:** Pilsbry 1934, 1939.

**Distribution:** Western North America, from British Columbia and Alberta south to Nevada, Arizona and New Mexico. In Montana, reported on both sides of the Continental Divide from 22 counties. Elevation range is 661 to 2623 m (2170 to 8605 ft).

**Habitat:** Near streams, moister forested locations, and in drier sites including talus slopes and vegetated rockslides or stony ground; *O. s. berryi* associated with limestone. Canopy species include Douglas-fir, lodgepole pine, ponderosa pine, western redcedar, western hemlock, western larch, Engelmann spruce, rocky mountain juniper, aspen, black cottonwood, mountain maple, alder, and willow. Live animals present mostly under rocks or wood and in duff or soil accumulations; sun-bleached shells may be found on the surface.

**Conservation Status:** No special status in Montana (G5 S5) for the full species; *O. s. berryi* (Berry's Mountainsnail) a Montana Species of Concern (G5T2, S1S2).

**Remarks:** May be abundant at some locations; more than 100 shells were reported at single sites in Broadwater and Fergus counties and 30 live individuals at one Carbon County site. Validity, status and distribution of the various subspecies need additional study. *Oreohelix strigosa* probably includes a multitude of full species lumped under one name; whereas *O. s. cooperi* already is treated as a full species by some authors. *Oreohelix strigosa berryi* described originally in 1915 from specimens collected in Swimming Woman Creek Canyon of the Big Snowy Mountains in Golden Valley County.

**Selected References:** Berry 1916; Elrod 1903b; Forsyth 2004; Frest and Johannes 1995, 2001; Henderson 1924, 1936; Pilsbry 1939; Russell 1951; Smith 1943; Weaver et al. 2006.



*Oreohelix subrudis* - Subalpine Mountainsnail

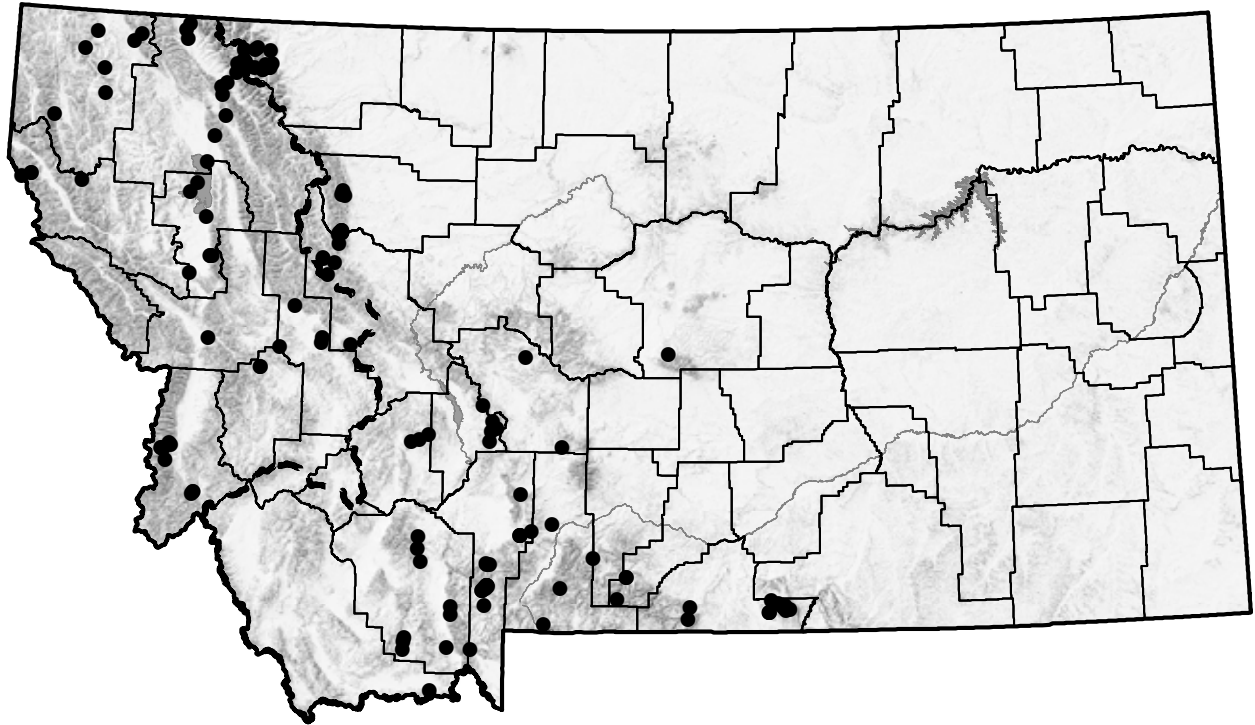


Photo by MTNHP

***Oreohelix subrudis* (“Pfeiffer,” Reeve, 1854) Subalpine Mountainsnail**

**Synonyms:** *Helix subrudis*, *Helix cooperi*, *Pyramidula strigosa cooperi*.

**Subspecies:** *O. s. subrudis*, *O. s. apiarium*, *O. s. limitaris*.

**Description:** Highly variable in form. Medium-sized to large, the diameter ranges from 11 to 23 mm, but usually more than 15 mm (new-born young about 2 or 3 mm diameter), and from 8 to 18 mm in height, depending on subspecies and local conditions. Typically heliciform to almost bee-hive shaped, with up to 6 whorls; the periphery is weakly angular. Umbilicus is narrow and deep, the aperture ovate to rounded, slightly thickened inside. Shell opaque and chalky, color pale gray to brownish (dead shells may be white), with a series of reddish-brown spiral bands, typically one on the upper surface and another just below the periphery, sometimes with one or more fainter bands below that. Shell surface with coarse irregular axial riblets and striae, sometimes with faint spiral sculpting.

**Internal Anatomy:** Pilsbry 1939.

**Distribution:** Western North America, from British Columbia and Alberta south through Washington, Idaho, and Montana to Arizona and New Mexico. In Montana, reported on both sides of the Continental Divide from 21 counties. Elevation range is 838 to 2313 m (2750 to 7590 ft).

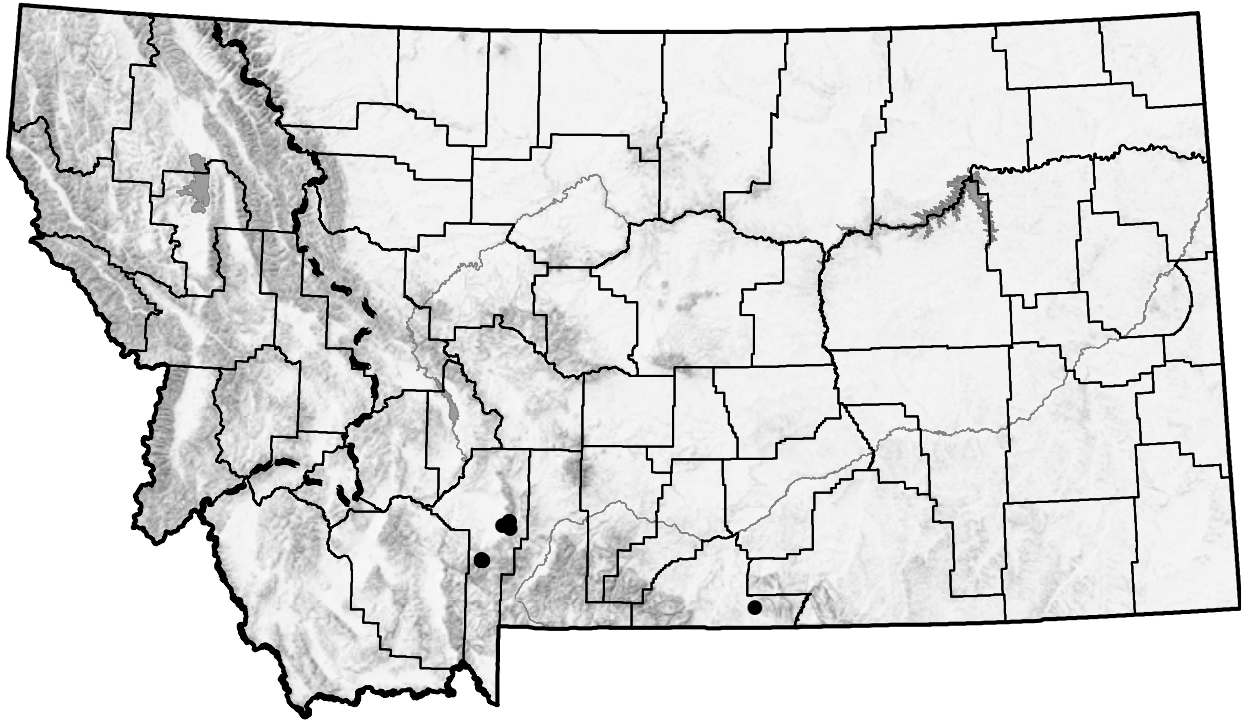
**Habitat:** Often in relatively moist sites, along stream courses and near seeps or springs, sometimes in talus slopes. Canopy species include western red-cedar, western hemlock, Douglas-fir, Engelmann spruce, ponderosa pine, limber pine, black cottonwood, aspen, paper birch, alder, willow, and rocky mountain juniper. Live animals present mostly in leaf litter, and under downed wood, rocks, and in duff or soil accumulations under wood and rocks; sun-bleached shells may be found on the surface.

**Conservation Status:** No special status in Montana (G5 S5).

**Remarks:** May be abundant at some locations; as many as 60 live animals and 75 shells were reported at site in Gallatin County. *Oreohelix subrudis apiarium* was described originally from specimens collected in 1916 along McDonald Creek in Glacier National Park. *O. s. apiarium* and *O. s. limitaris* may be synonyms.

**Selected References:** Beetle 1961, 1987, 1989, 1997; Berry 1919; Elrod 1903b; Forsyth 2004; Hammer and Brunson 1975; Henderson 1936; Hendricks 2009; Pilsbry 1939; Russell 1951; Russell and Brunson 1967; Vanatta 1914.

***Oreohelix yavapai* - Yavapai Mountainsnail**



*Photo by MTNHP*



***Oreohelix yavapai* Pilsbry, 1905**

**Yavapai Mountainsnail**

**Synonyms:** None.

**Subspecies:** *O. y. extremitatis*, *O. y. mariae*.

**Description:** The shell is medium to large, up to 23 mm diameter but usually less than 21 mm (new-born young about 2 or 3 mm diameter), and to 11 mm in height but usually less than 10 mm; flattened heliciform (spire only moderately elevated) with up to 5 1/2 whorls, the sutures generally filled by the keel of the previous whorl. Umbilicus is broad, a little larger than 1/4 the shell diameter, aperture is very oblique and oval, periphery of body whorl keeled but more weakly on the last quarter turn. Shell opaque and chalky, color is brownish-gray to whitish (dead shells to pearly white), with two reddish-brown spiral bands, one on the upper surface and a prominent band near the periphery on the lower surface. The last whorl has a cord-like keel on the periphery and sometimes descends below the periphery to the aperture. The surface is wrinkled with fine spiral striae.

**Internal Anatomy:** Pilsbry 1939.

**Distribution:** Montana and Wyoming south to Arizona and New Mexico. In Montana, about 13 records from about six sites in two counties east of the Continental Divide: Carbon (1), Gallatin (5). Elevation range is 1513 to 1890 m (4965 to 6200 ft).

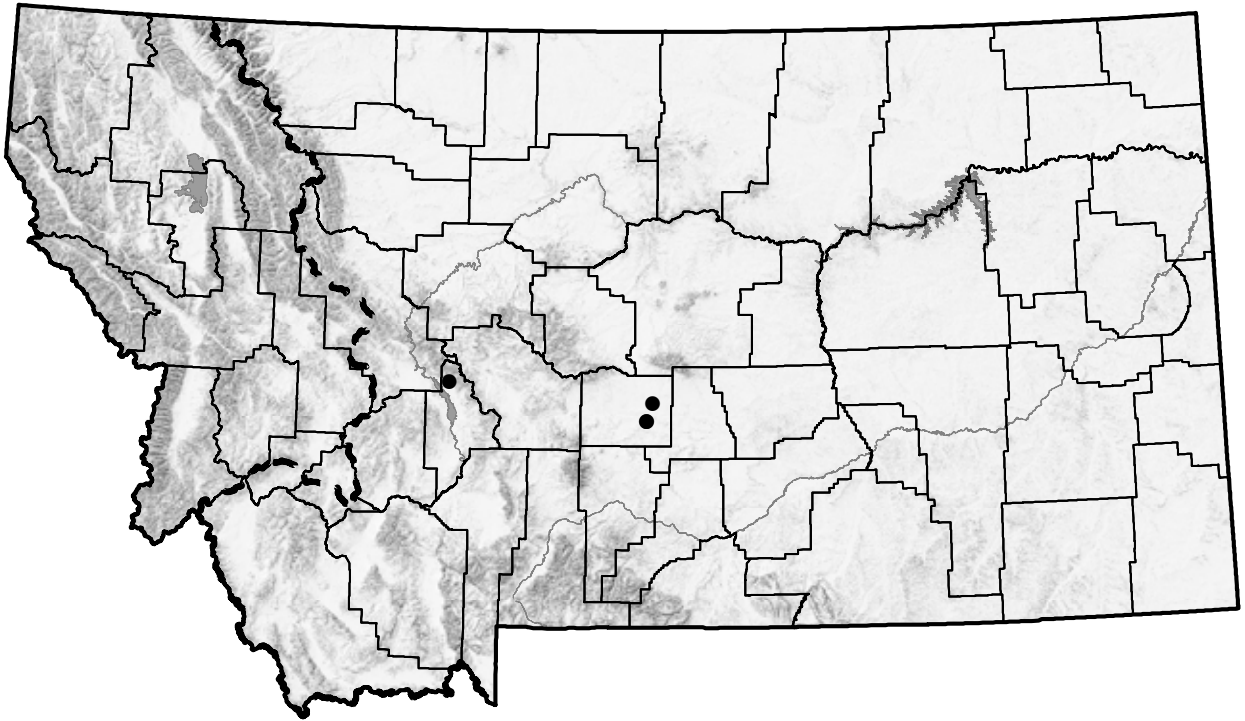
**Habitat:** Associated primarily with dry limestone outcrops and rocky soils. Tree canopy absent to scattered; canopy species where present include scattered Douglas-fir, Rocky Mountain juniper, and Utah juniper. Ground cover scattered but includes sagebrush and bunch grasses. Live animals occur mostly under junipers in duff or soil accumulations under rocks; sun-bleached shells may be found on the surface.

**Conservation Status:** No special status in Montana (G5 SNR) for the full species; *O. y. mariae* (Gallatin Mountainsnail) is a Montana Species of Concern (G5T1 S1).

**Remarks:** Moderately abundant at some localities; as many as 56 (live and shells) were seen at one site in Gallatin County in late August. Range, abundance, and status in Montana still poorly defined; current status needs further investigation. *Oreohelix yavapai mariae* was originally described in 1916 from specimens collected above Storm Castle Creek (formerly Squaw Creek) in Gallatin County.

**Selected References:** Bartsch 1916; Beetle 1961, 1987, 1989; Frest and Johannes 1995; Henderson 1924, 1933; Pilsbry 1939.

*Hawaiiia minuscula* - Minute Gem



*Photo by David Kirsh*

***Hawaiiia minuscula* (Binney, 1840) Minute Gem**

**Synonyms:** *Zonitoides miniscula*, *Pseudohyalina miniscula*.

**Subspecies:** None.

**Description:** A very small shell, to 2.5 mm diameter and 1.2 mm in height, flattened heliciform, nearly smooth with uneven striations on the upper surface, about 4 to 4 1/2 whorls, the last tubular and not greatly expanded. Shell coloration is pale gray to flesh-colored. Aperture is crescent-shaped, rounded at the periphery; umbilicus wide, about 1/3 the shell diameter. The animal is light-colored.

**Internal Anatomy:** Pilsbry 1946.

**Distribution:** Widespread in North America although probably introduced in many areas; probably introduced throughout the Caribbean and Japan. In Montana, reported from two counties east of the Continental Divide: Broadwater, Wheatland. Elevation range is 823 to 1373 m (2700 to 4505 ft).

**Habitat:** Frequents a variety of sites, wooded to relatively exposed and arid. Found under limestone and sandstone rocks in sites sparsely vegetated with juniper and grass, in willow litter, also under Douglas-fir and ponderosa pine canopy.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Range and habitats poorly defined in Montana. At least two Montana records are shells from drift material along water courses, and whose origins may be distant from the reported locations.

**Selected References:** Berry 1916; Forsyth 2004; Frest and Johannes 2001; Henderson 1936; Pilsbry 1946, Squyer 1894.

*Pristiloma wascoense* - Shiny Tightcoil

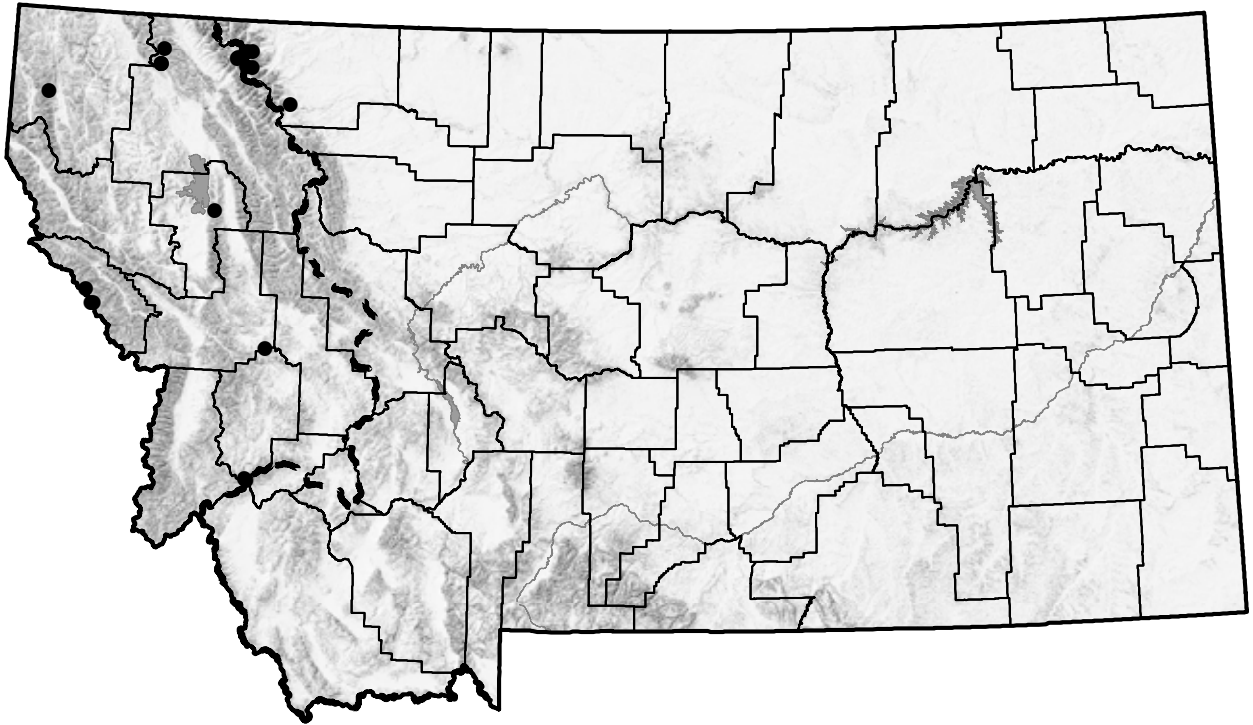


Photo by MTNHP

***Pristiloma wascoense* (Hemphill, 1911) Shiny Tightcoil**

**Synonyms:** *Tonites wascoense*, *Polita chersinella* (in part).

**Subspecies:** None.

**Description:** A small shell, to about 3.0 mm diameter and 1.5 mm in height, depressed heliciform, with up to 5 whorls. Shell is transparent amber brown, smooth (until seen under magnification) and shiny, appearing darker brown when the animal is alive. Aperture is crescent-shaped, umbilicus is narrow and deep. The body and tentacles are dark.

**Internal Anatomy:** Not described.

**Distribution:** Washington and Oregon east through western Montana. In Montana, 20 records from seven counties west or near the Continental Divide: Deer Lodge (1), Flathead (6), Glacier (6), Granite (2), Lake (1), Lincoln (1), Mineral (3). Elevation range is 1152 to 2582 m (3780 to 8470 ft).

**Habitat:** Mesic mixed conifer forest. Canopy species include Engelmann spruce, subalpine fir, whitebark pine and lodgepole pine, with a secondary canopy including alder. Found under woody debris and rocks, in leaf and needle litter and duff.

**Conservation Status:** Montana Species of Concern (G3 S1S3).

**Remarks:** The earliest Montana specimens from Glacier National Park were reported in 1916 and originally assigned to *Pristiloma chersinella*. No other member of the genus has been documented in Montana, where the range remains poorly defined. Up to six live animals were reported at one site in Deer Lodge County in late July.

**Selected References:** Baker 1930; Berry 1919; Frest and Johannes 1995, 2001; Henderson 1936; Hendricks 2009; Pilsbry 1946; Russell and Brunson 1967.

*Euconulus fulvus* - Brown Hive

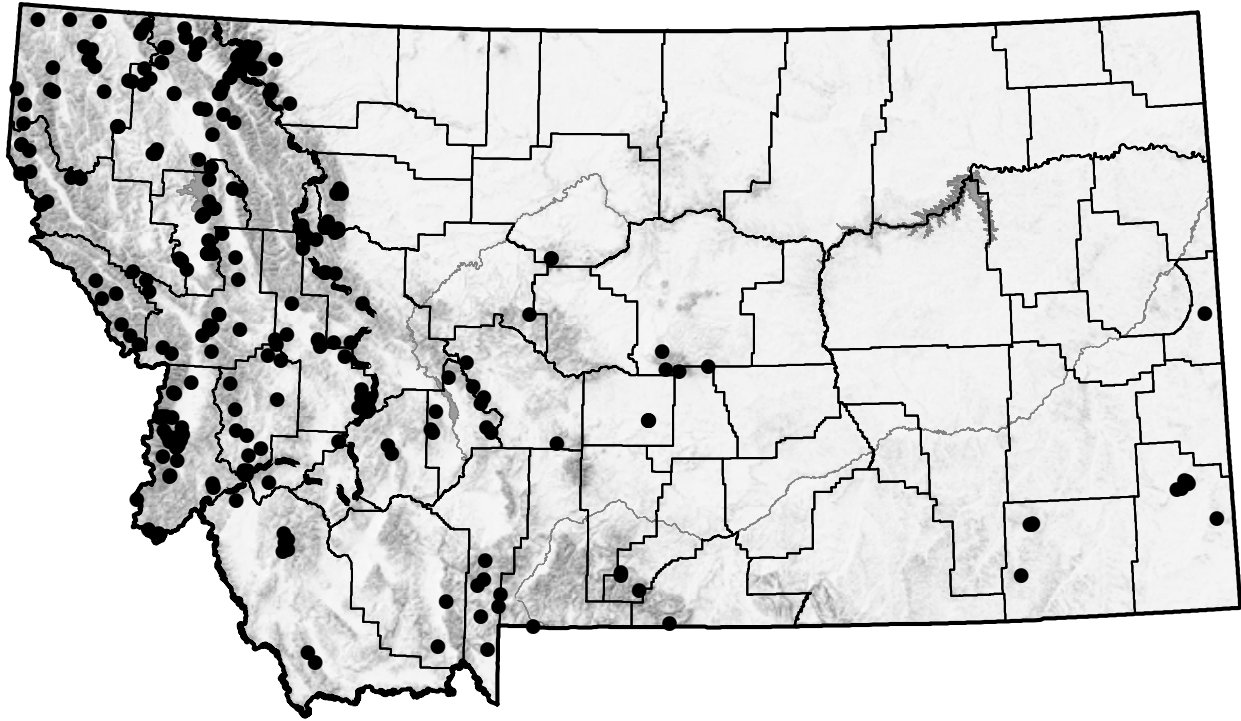


Photo by MTNHP

***Euconulus fulvus* (Müller, 1774)    Brown Hive**

**Synonyms:** *Helix fulva*, *Zonites fulvus*, *Conulus fulvus*, *Euconulus trochiformis*.

**Subspecies:** *E. f. alaskensis*; subspecies validity is questionable.

**Description:** A small shell slightly wider than tall, to 3.5 mm diameter and 2.5 mm in height, beehive-shaped or conical heliciform, with up to 5 1/2 whorls. Shell is translucent brown to dark brown, with very fine axial threads and spiral striae requiring magnification to see; periphery is rounded or slightly angular. Aperture is crescent-shaped, umbilicus extremely tiny or absent. The tail is gray, head and tentacles are dark, and the mantle has large dark patches visible through the last whorl of the shell.

**Internal Anatomy:** Pilsbry 1946.

**Distribution:** Circumboreal-circumtemperate, south to North Africa and in North America to Sinaloa, Mexico. In Montana, reported from 27 counties across the state on both sides of the Continental Divide. Elevation range is 655 to 2518 m (2150 to 8260 ft).

**Habitat:** A wide range of habitats, from wet forest and riparian areas to dry grassy sites and isolated aspen pockets. Tree canopy species include western redcedar, western hemlock, grand fir, Douglas-fir, Engelmann spruce, subalpine fir, black cottonwood, western larch, lodgepole pine, whitebark pine and aspen; secondary canopy includes alder, willow, dogwood and paper birch. Found under woody debris and rocks in leaf litter and duff.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Has been observed as a victim of attack by snail-eating ground beetles (*Scaphinotus*). May be abundant locally; 40 were found at one site in Flathead County in late August.

**Selected References:** Beetle 1989; Berry 1916; Forsyth 2004; Frest and Johannes 2001; Hendricks 2009; Pilsbry 1946; Russell and Brunson 1967.



*Striatura pugetensis* - Northwest Striate

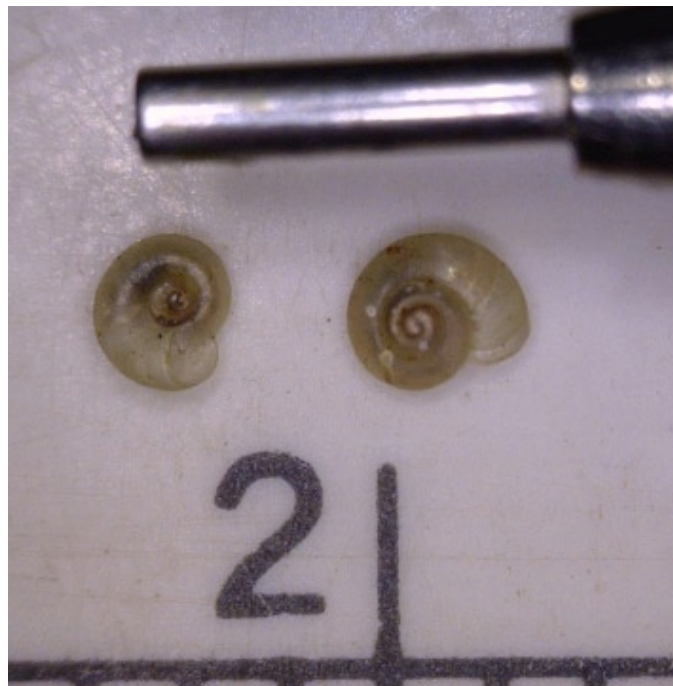
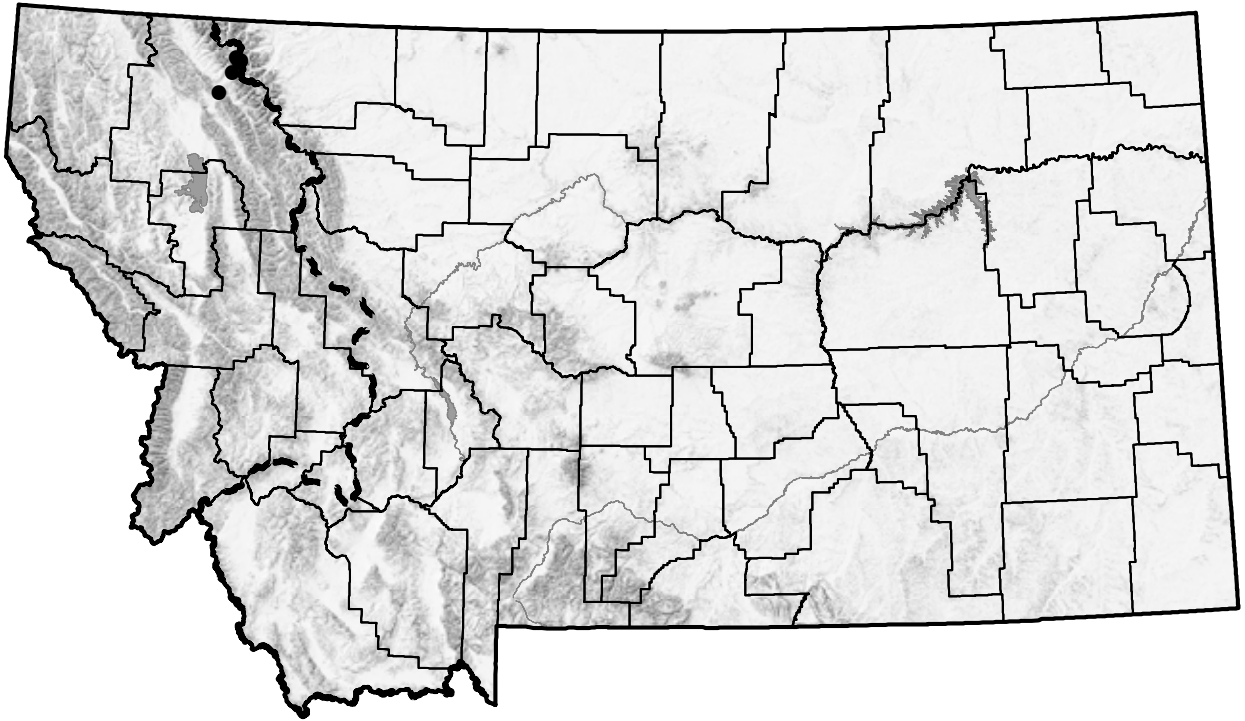


Photo by MTNHP

***Striatura pugetensis* (Dall, 1895) Northwest Striate**

**Synonyms:** *Patulastra pugetensis*, *Radiodiscus hubrichti*.

**Subspecies:** None.

**Description:** A very small shell, to 1.8 mm diameter and 0.5 mm in height, flattened heliciform with a low spire, to about 3 whorls. Shell coloration is pale translucent yellowish-green, inner 1 1/2 whorls with fine spiral threads (requiring magnification to see) then abruptly switching to close and regular and oblique axial riblets, the last whorl gradually expanding. Aperture is large, oblique, and rounded, without denticles (teeth); umbilicus is wide, more than 1/3 the diameter of the shell. The animal is translucent white with gray head and tentacles and a black patch over the lung.

**Internal Anatomy:** Pilsbry 1946.

**Distribution:** Alaska to Mexico and east to Montana; also on Kauai, Hawaii. In Montana, five records west of the Continental Divide from Flathead County, all in Glacier National Park. Elevation range is 1021 to 1256 m (3350 to 4120 ft).

**Habitat:** Mixed mesic conifer forest in moist sites at lower elevations. Canopy species include western hemlock, grand fir, Engelmann spruce, black cottonwood and western larch; secondary canopy includes alder, dogwood, paper birch and mountain ash. Found under woody debris, mossy mats and ferns, in leaf litter or duff.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** First reported in Montana in 1916 but not seen again until 2008. Range and habitat remain poorly defined, status is uncertain. Up to five animals have been found at a single site.

**Selected References:** Berry 1919; Forsyth 2004; Frest and Johannes 2001; Hendricks 2009; Pilsbry 1946; Russell and Brunson 1967.

*Zonitoides arboreus* - Quick Gloss

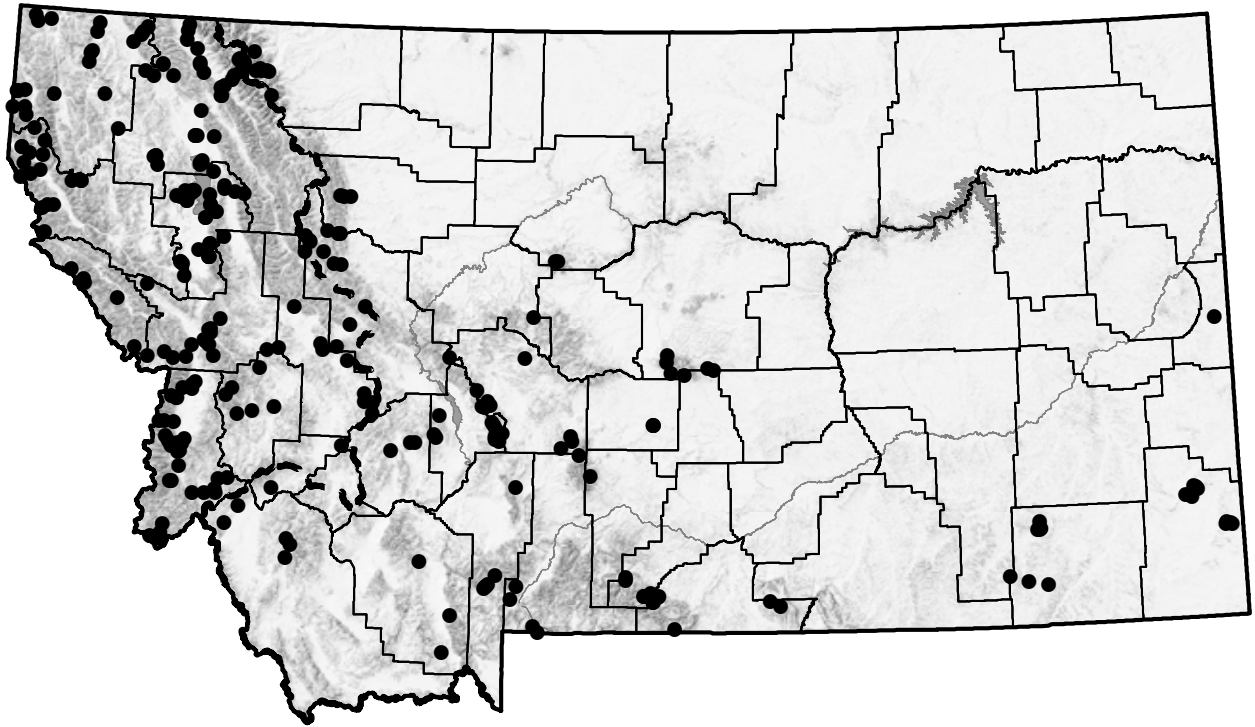


Photo by MTNHP

***Zonitoides arboreus* (Say, 1816) Quick Gloss**

**Synonyms:** *Helix arboreus*, *Zonites arboreus*, *Hyalina arborea*, *Helix breweri*, *Hyalina breweri*, *Helix whitneyi*, *Hyalina whitneyi*.

**Subspecies:** None.

**Description:** A small shell, to 5.6 mm diameter and 3 mm in height, flattened heliciform, with weak incremental wrinkles and extremely small spiral striae (requiring strong magnification to see), about 4 to 4 1/2 whorls, the last not greatly expanded. Shell coloration is translucent olive to brown, glossy. Aperture is crescent-shaped, wider than high, lacking teeth (denticles); umbilicus relatively narrow, about 1/4 to 1/5 the shell diameter. Animal is bluish gray on the head, paler on the sides and foot, tentacles darker; lacks the orange mantle spot (visible through the shell) of *Zonitoides nitidus*.

**Internal Anatomy:** Pilsbry 1946.

**Distribution:** North and Central America to the West Indies. Introduced to South America, Europe, and Asia. In Montana, reported from both sides of the Continental Divide in 28 counties. Elevation range is 655 to 2309 m (2150 to 7575 ft).

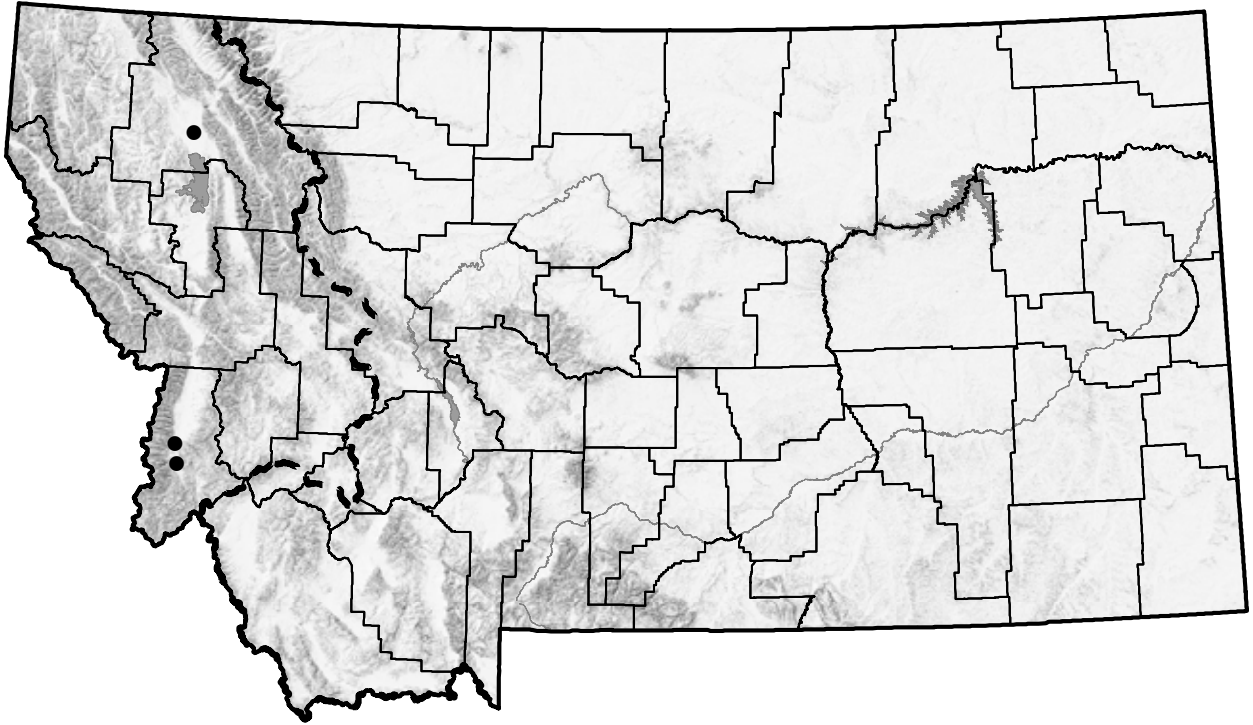
**Habitat:** A variety of forested habitats where moisture retained or available. Canopy species include most conifers (including junipers), cottonwoods, aspen, birches, green ash and American elm; secondary canopy includes alder, willow, dogwood, mountain maple, current and hawthorn. Often found under woody debris and rocks, in downed rotten wood, leaf litter, and duff. Inhabits isolated aspen stands.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** The species is a regular victim of larval snail-killing flies (Diptera: Sciomyzidae). It may be relatively abundant in some locations; 42 were found at a site in Chouteau County in late September.

**Selected References:** Berry 1916, 1919; Foote 2007; Forsyth 2004; Frest and Johannes 2001; Pilsbry 1946; Russell and Brunson 1967; Vanatta 1914.

*Zonitoides nitidus* - Black Gloss



*Photo by Kevin Ripka*

***Zonitoides nitidus* (Müller, 1774) Black Gloss**

**Synonyms:** *Helix nitida*, *Zonites nitidus*, *Hyalina hydrophyla*.

**Subspecies:** None.

**Description:** A small shell, to about 6 mm diameter or more and 3 mm in height, flattened heliciform with weak wrinkle-like axial striae, 4 ½ to 5 whorls, the last not greatly expanded. Shell coloration is somewhat transparent and shiny olive to brown. Aperture is crescent-shaped, wider than high, lacking teeth (denticles), periphery rounded; umbilicus about 1/5 the shell diameter. Animal is dark to blackish, mantle with a dull orange spot visible through the shell behind the aperture.

**Internal Anatomy:** Pilsbry 1946.

**Distribution:** Across much of the Northern Hemisphere. In Montana, reported west of the Continental Divide from the Bitterroot Valley in Ravalli County, between Stevensville and Darby, and along the Stillwater River in Flathead County. Elevation range is 991 to 1372 m (3250 to 4500 ft).

**Habitat:** Usually at lower elevations near wetlands and marshy places, never in forested uplands. Found under woody debris and rocks, in leaf litter or duff.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Omnivorous. Range in Montana possibly under-represented due to mistaken identification as *Zonitoides arboreus*, especially dead shells; possibly introduced to the state. Only a few individuals so far have been reported at any site.

**Selected References:** Forsyth 2004; Frest and Johannes 2001; Pilsbry 1946; Vanatta 1914.



*Nesovitrea binneyana* - Blue Glass

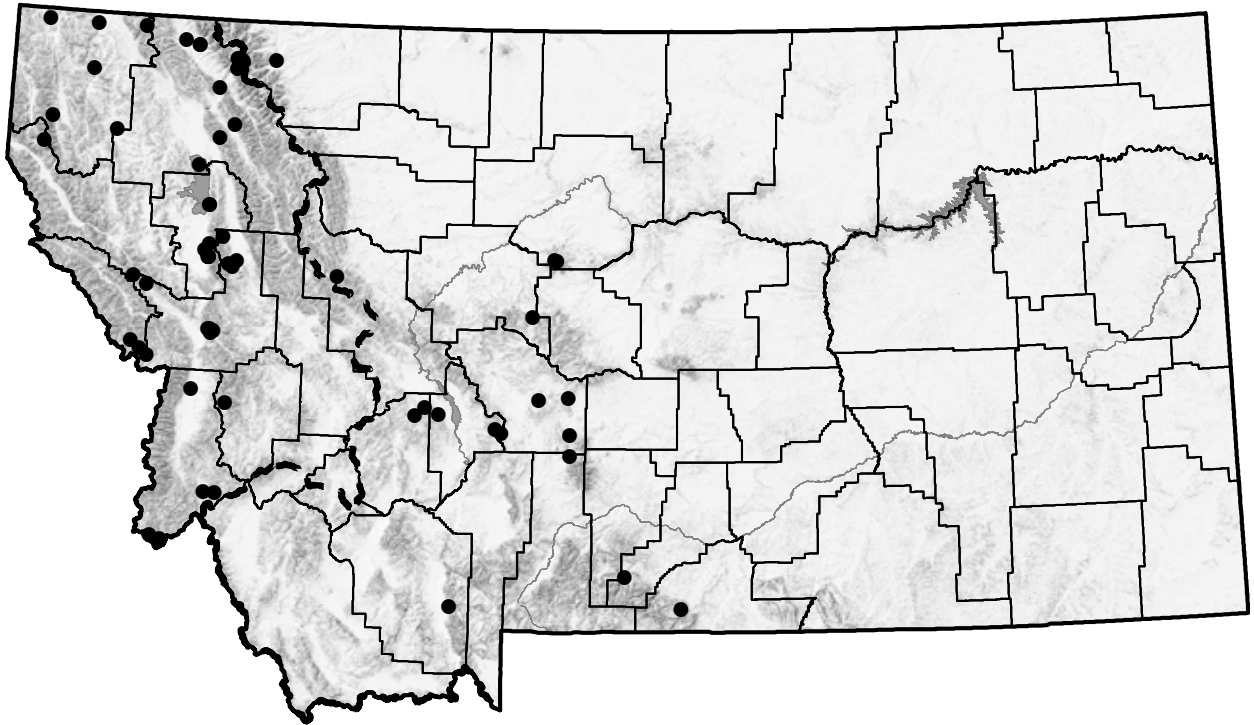


Photo by MTNHP



***Nesovitrea binneyana* (Morse, 1864) Blue Glass**

**Synonyms:** *Retinella binneyana*, *Polita binneyana*, *Hyalina binneyana*.

**Subspecies:** *N. b. occidentalis*; possibly invalid.

**Description:** A small shell, to 3.7 mm diameter and 2.0 mm in height, flattened heliciform with a low spire, surface with narrow and widely spaced axial grooves, microscopic spiral striae, about 3 1/2 to 4 whorls, the last rapidly increasing in width. Shell coloration is glossy translucent to transparent, nearly colorless with a pale greenish tinge. Aperture is oblique, crescent-shaped, wider than tall, and without teeth (denticles), lip not thickened, periphery rounded; umbilicus relatively narrow, about 1/5 the shell diameter. Animal is pale grayish on the head and tentacles.

**Internal Anatomy:** Pilsbry 1946.

**Distribution:** Native to North America from British Columbia to Quebec and Maine, south through the Cascade Mountains to California, in the Rocky Mountains to Colorado. In Montana, reported on both sides of the Continental Divide from 19 counties. Elevation range is 917 to 2048 m (3010 to 6720 ft).

**Habitat:** Occupies a variety of forested habitats. Canopy species include Douglas-fir, Engelmann spruce, western redcedar, grand fir, western larch, ponderosa pine, lodgepole pine, aspen, and black cottonwood; secondary canopy includes alder, willow, paper birch, mountain maple, and hawthorn. Often found under woody debris, rocks, bryophyte mats, in leaf litter or duff.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Appears to be uncommon in most locations; nine were reported at a site in Jefferson County in late September.

**Selected References:** Beetle 1961, 1989; Berry 1919; Forsyth 2004; Frest and Johannes 2001; Hendricks 2009; Pilsbry 1946; Russell and Brunson 1967.

*Nesovitrea electrina* - Amber Glass

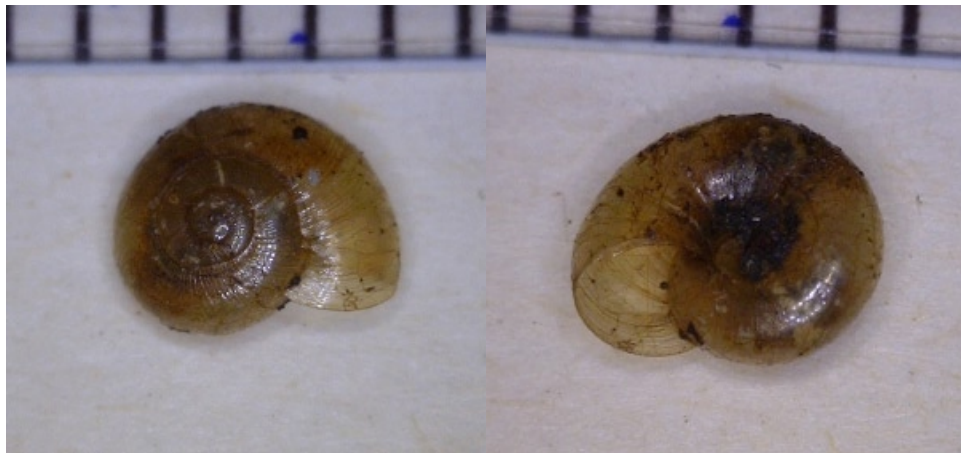
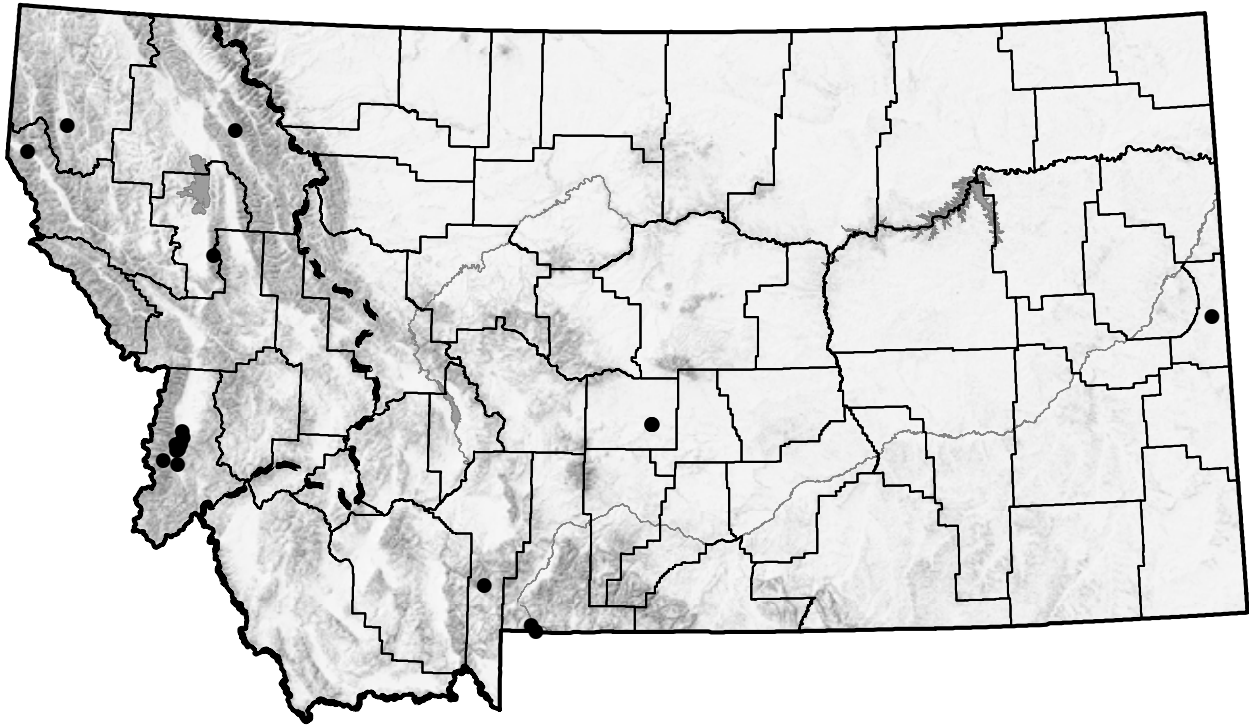


Photo by MTNHP

***Nesovitrea electrina* (Gould, 1841) Amber Glass**

**Synonyms:** *Retinella electrina*, *Polita hammonis*, *Nesovitrea hammonis*, *Vitrea hammonis*, *V. radiatula*, *Helix electrina*, *Hyalina pellucida*.

**Subspecies:** None.

**Description:** A small shell, to about 5 mm diameter and 2.5 mm in height, flattened heliciform with a low spire, surface with narrow widely-spaced axial grooves but no fine spiral striae, about 3 1/2 to 4 whorls, the last rapidly increasing in width. Shell coloration is translucent to transparent pale amber to brownish. Aperture is oblique crescent-shaped, wider than tall and without teeth (denticles), lip not thickened, periphery rounded; umbilicus is relatively narrow, about 1/6 the shell diameter. Animal is dark to blackish on the head and tentacles

**Internal Anatomy:** Pilsbry 1946.

**Distribution:** Alaska to Labrador, in the west to Arizona and New Mexico. In Montana, reported on both sides of the Continental Divide, from nine counties: Flathead, Gallatin, Lake, Lincoln, Park, Ravalli, Sanders, Wheatland, Wibaux. Elevation range is 823 to 1975 m (2700 to 6480 ft), unverified report in Ravalli County to 2743 m (9000 ft) or higher.

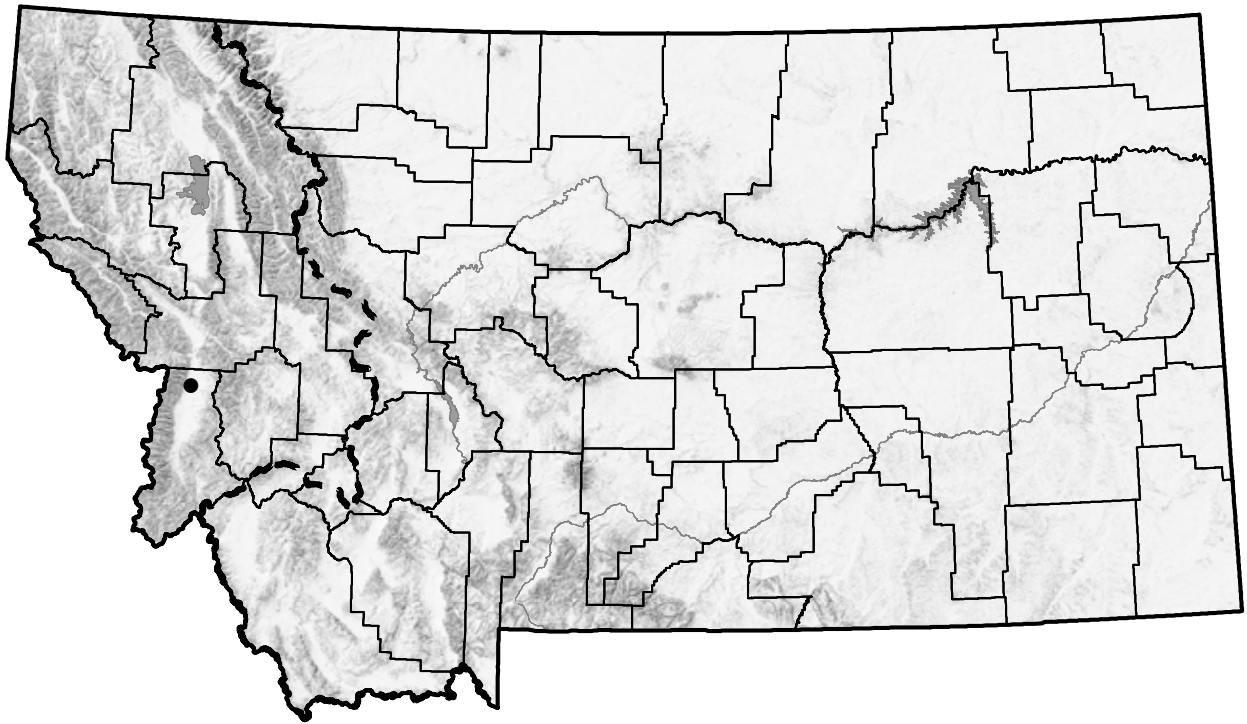
**Habitat:** A variety of wooded locations, often more restricted to moister sites, such as riparian zones, than *Nesovitrea binneyana*. Canopy species include Engelmann spruce, Douglas-fir, western larch, aspen, cottonwood, and Rocky Mountain juniper; secondary canopy includes paper birch, alder, and willow. Found under woody debris, rocks, bryophyte mats, in leaf litter or duff.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** All generic forms previously referred to as “*hammonis*” are treated here as *Nesovitrea electrina*, although the name may have been applied by some authors to *N. binneyana*. Range and habitats in Montana are poorly defined. Appears to be uncommon in most locations; six were observed at locality in Park County in late August.

**Selected References:** Beetle 1961, 1989; Berry 1913, 1916; Forsyth 2004; Frest and Johannes 2001; Pilsbry 1946; Squyer 1894; Vanatta 1914.

***Oxychilus alliarius* - Garlic Glass-snail**



*Photo by David Nichols*

***Oxychilus alliarius* (J. S. Miller, 1822) Garlic Glass-snail**

**Synonyms:** *Helix alliaria*, *Zonitoides alliaria*.

**Subspecies:** None.

**Description:** A small shell, to 7 mm diameter and 3 mm in height but often smaller, flattened heliciform, smooth with some fine incremental striae, about 5-6 whorls, the last expanding to the aperture. Shell coloration is translucent amber brown on the upper surface, lighter on the undersurface. Aperture is large, oblique crescent-shaped, without teeth (denticles); periphery rounded; umbilicus about 1/6 the shell diameter. The animal is dark gray to blackish and emits a strong garlic odor when handled.

**Internal Anatomy:** Giusti and Manganelli 1997.

**Distribution:** Western Europe; introduced elsewhere, including North America. In Montana, only one report from Lee Metcalf National Wildlife Refuge, Ravalli County, west of the Continental Divide; elevation 991 m (3250 ft).

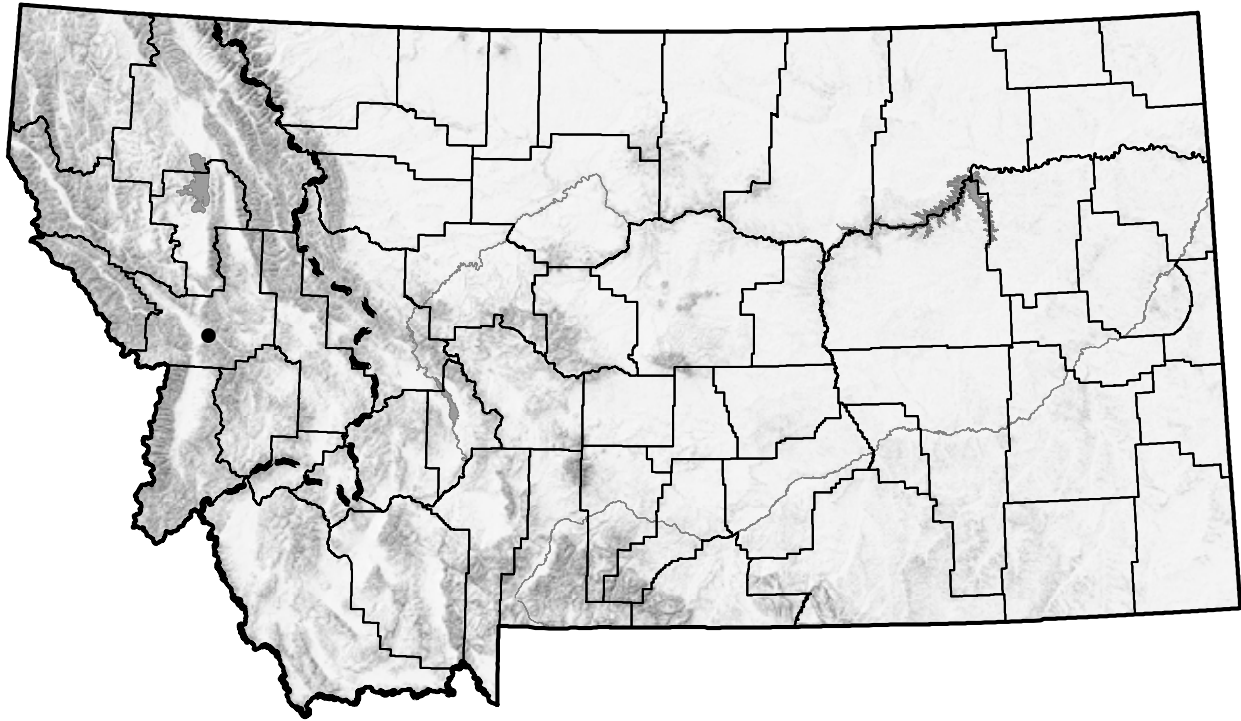
**Habitat:** Frequents moist sites in parks, gardens, and other modified habitats. Found at Lee Metcalf National Wildlife Refuge at the edge of a water-filled slough under woody debris, leaf litter, and grassy vegetation, with nearby black cottonwood canopy.

**Conservation Status:** Introduced; no special status in Montana (G5 SNA).

**Remarks:** Omnivorous. First reported for Montana in 2009. Range and habitat poorly defined in Montana; probably occurs in many additional urban settings and valley bottoms. May be locally abundant; 28 live animals were seen at Lee Metcalf National Wildlife Refuge in late June (P. Hendricks, pers. obs.).

**Selected References:** Forsyth 2004; Frest and Johannes 2001; Giusti and Manganelli 1997; Pilsbry 1946.

***Oxychilus draparnaudi* - Dark-bodied Glass-snail**



*Photo by MTNHP*



***Oxychilus draparnaudi* (Beck, 1837) Dark-bodied Glass-snail**

**Synonyms:** *Helix lucida*, *Helicella draparnaudi*.

**Subspecies:** None.

**Description:** A medium sized shell, to 16 mm diameter and 8 mm in height but often smaller (Montana specimens averaged 10.6 mm diameter and reached 12.3 mm), flattened heliciform, smooth but with irregular incremental wrinkles and striae, about 5-6 whorls, the last whorl expanded at the aperture to more than twice the width of the previous whorl. Shell coloration is mottled pale brown above, paler below, glossy and translucent. Aperture is large, strongly oblique and crescent-shaped, without teeth (denticles); periphery rounded; umbilicus about 1/6 the shell diameter. Animal is bluish-black to dark bluish-gray on head and tentacles.

**Internal Anatomy:** Giusti and Manganelli 1997.

**Distribution:** Western Europe and Mediterranean; introduced widely elsewhere including North America. In Montana, one report from East Missoula, Missoula County, west of the Continental Divide; elevation 1000 m (3280 ft).

**Habitat:** Frequents parks, gardens, and other modified habitats. Found in East Missoula under stacked lumber, rocks, woody debris, and brush, and in leaf litter.

**Conservation Status:** Introduced; no special status in Montana (G5 SNA).

**Remarks:** Carnivorous. First reported for Montana in 2009. Range and habitat poorly defined in Montana; probably occurs in many additional urban settings and valley bottoms. May be locally abundant; more than 30 individuals were found at the East Missoula site in early May.

**Selected References:** Forsyth 2004; Frest and Johannes 2001; Guisti and Manganelli 1997; Pilsbry 1946.



*Vitrina pellucida* - Western Glass-snail

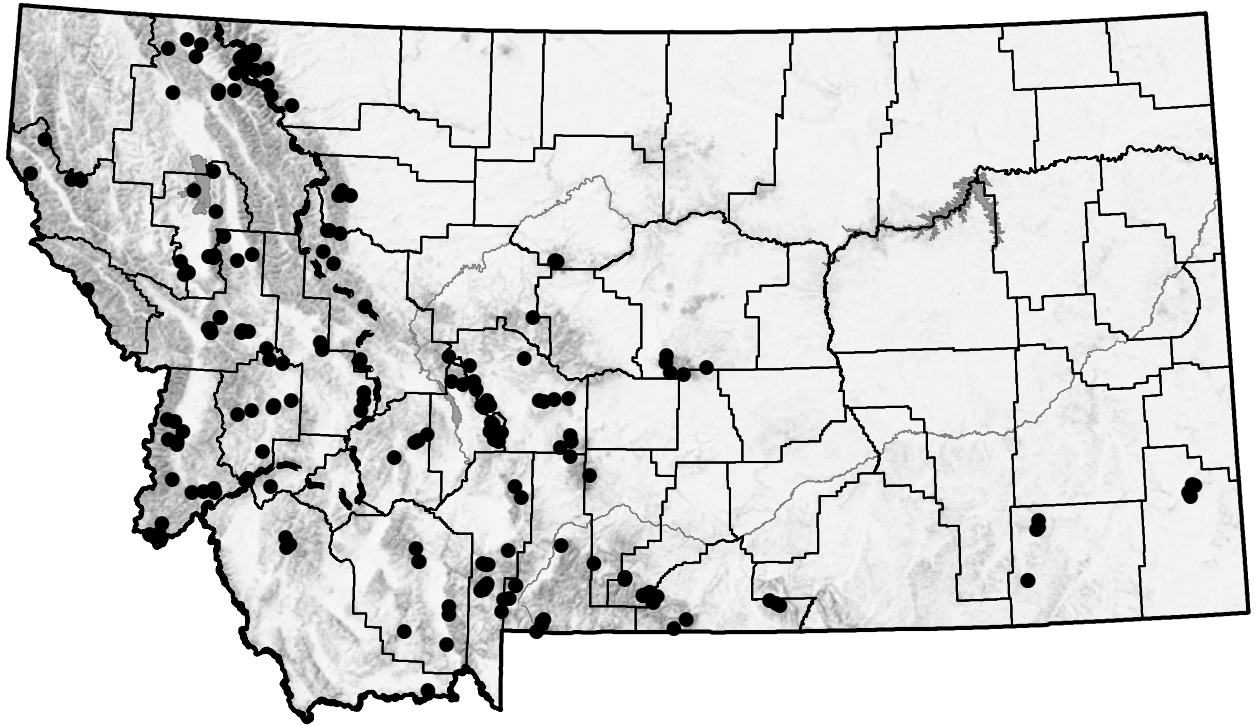


Photo by MTNHP

***Vitrina pellucida* (Müller, 1774) Western Glass-snail**

**Synonyms:** *Helix pellucida*, *Vitrina alaskana*, *V. pfeifferi*.

**Subspecies:** None.

**Description:** A moderately small shell, up to about 6 mm diameter and 4 mm in height, heliciform with a low and small spire, very fragile, 2 1/2 to 3 whorls, the last rapidly enlarging to form about half of the shell. Shell coloration is pale greenish or yellowish to almost colorless, translucent to transparent, shell smooth and glossy, with low axial wrinkles. Aperture is large and thin, oblique-ovate and rounded, without teeth; umbilicus tiny. Animal brownish, head and tentacles darker grayish.

**Internal Anatomy:** Forsyth 2004.

**Distribution:** Widespread across Eurasia, in North America from Alaska to California to Rocky Mountains, including Arizona and New Mexico. In Montana, reported from both sides of the Continental Divide in 27 counties. Elevation range is 838 to 2582 m (2750 to 8470 ft).

**Habitat:** Forest with broadleaf or mixed broadleaf-conifer canopy, near moisture; in campgrounds and roadside ditches, isolated aspen stands. Canopy species include cottonwoods, aspen, Douglas-fir, Engelmann spruce, lodgepole pine, ponderosa pine, whitebark pine, subalpine fir and western redcedar, secondary canopy includes alder, paper birch, hawthorn, snowberry, thimbleberry, willow and mountain maple. Often found in more open areas under woody debris and bark, in dense ground vegetation, in leaf litter or duff, grazed and ungrazed sites.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** Carnivorous. No other land snail in the region resembles this species. Probably occupies all forested "island" mountain ranges in eastern Montana. May be locally abundant; up to 140 shells (60 live) were located at one site in Lewis and Clark County in early October.

**Selected References:** Beetle 1961; Berry 1916; Forsyth 2004; Frest and Johannes 2001; Pilsbry 1946; Russell 1951; Russell and Brunson 1967; Vanatta 1914.

*Allogona ptychophora* - Idaho Forestsnail

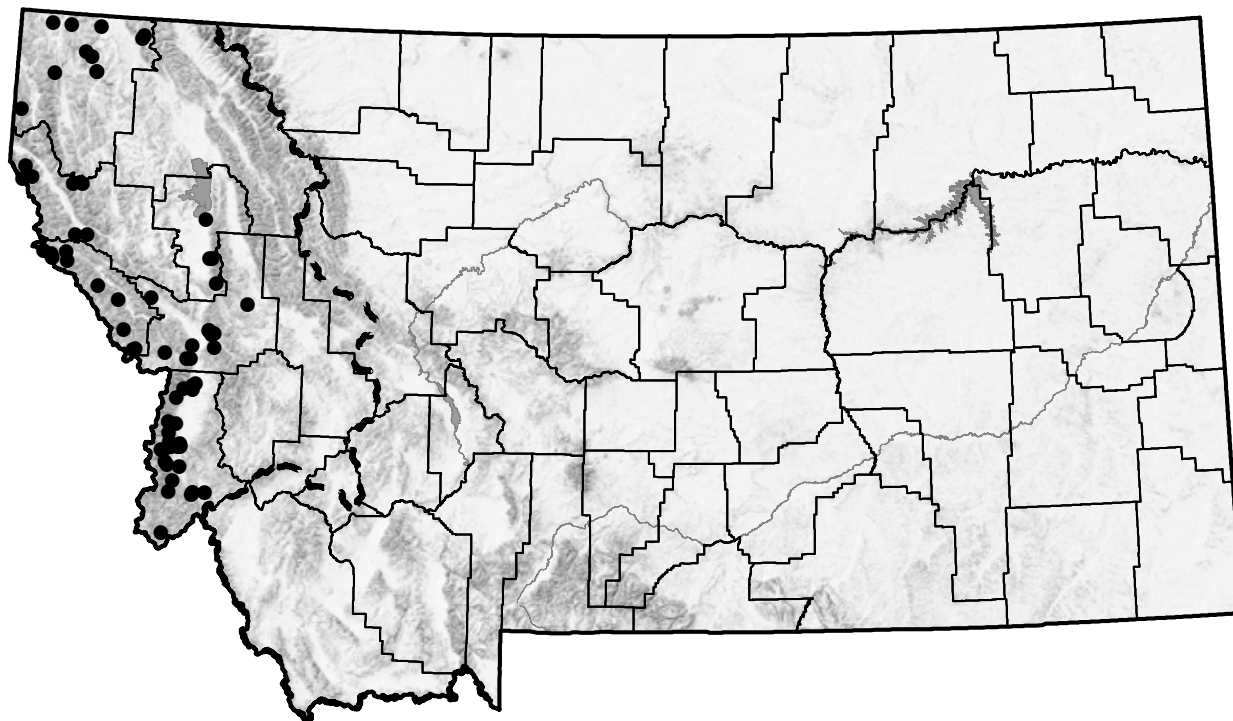


Photo by MTNHP

***Allogona ptychophora* (A. D. Brown, 1870) Idaho Forestsnail**

**Synonyms:** *Helix townsendiana*, *H. ptychophora*, *Mesodon ptychophorus*, *Polygyra townsendiana*, *P. ptycghophora*.

**Subspecies:** *A. p. solida*, only in Nez Perce County, Idaho.

**Description:** A large shell, to 24 mm in diameter and 15 mm in height, heliciform with up to 5 3/4 whorls. Shell is opaque and covered with a light brown chitinous layer (periostracum) that is never “hairy” and becomes worn away with age; shell also with fine incremental striae lighter in color and wrinkle-like axial riblets extending to the undersurface. Very fine wavy spiral striae present throughout the shell. The last whorl is slightly contracted behind the aperture lip, which is reflected, white, and slightly thickened near the base with a slightly bulging callus; aperture is oval, not rounded, the base partly obscuring the umbilicus, which is deep but very narrow.

**Internal Anatomy:** Pilsbry 1940.

**Distribution:** British Columbia to Oregon through western Montana. In Montana, reported from six counties west of the Continental Divide and abutting Idaho: Lake, Lincoln, Mineral, Missoula, Ravalli, Sanders. Elevation range is 777 to 1747 m (2550 to 5730 ft).

**Habitat:** Mesic mixed conifer forest, often near water such as stream-side riparian, and seeps, but sometimes well away from surface water. Canopy species include western redcedar, western hemlock, Engelmann spruce, Douglas-fir, grand fir, western larch, ponderosa pine, lodgepole pine, black cottonwood, aspen and paper birch; secondary canopy includes alder, willow, dogwood, and mountain maple. Found most often under woody debris or rocks in leaf litter and duff, sometimes on the surface and in the open.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** The winter survival of hibernating individuals is related to the orientation of the shell; those with the aperture pointed up rather than against the ground have a reduced probability of mortality for unknown reasons. Can be locally abundant; 164 reported were at one site in Missoula County in October.

**Selected References:** Carney 1966; Forsyth 2004; Frest and Johannes 2001; Illich 1966; Pilsbry 1940; Smith 1943; Vanatta 1914.



*Cryptomastix mullani* - Coeur d'Alene Oregonian

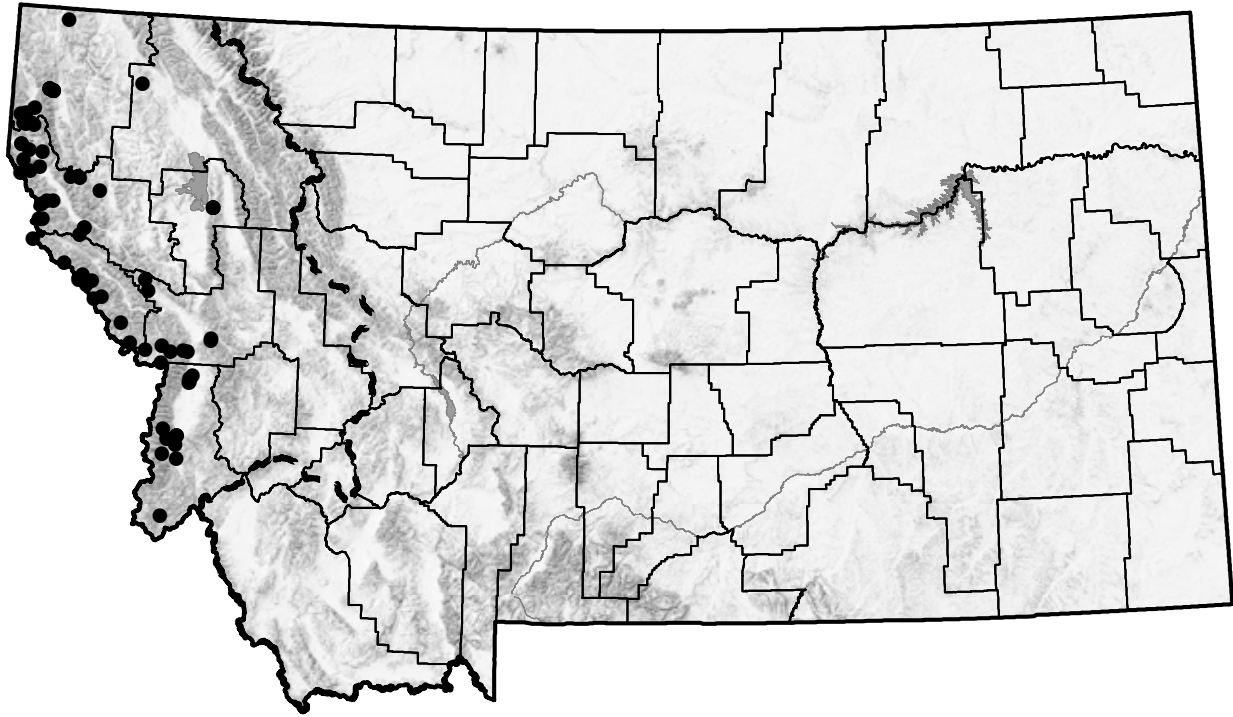


Photo by MTNHP

***Cryptomastix mullani* (Bland and Cooper, 1861)    Coeur d'Alene Oregonian**

**Synonyms:** *Helix mullani*, *Triodopsis mullani*, *Polygyra devia blandi*, *P. d. oregonensis*, *P. d. mullani*, *Polygyra mullani*.

**Subspecies:** *C. m. blandi*, *C. m. hemphilli*, *C. m. mullani*, and *C. m. olneyae*. The validity of all subspecies needs to be reevaluated.

**Description:** A medium shell, 12-17 mm diameter and up to 9.5 mm in height (variable among and within subspecies), heliciform to depressed heliciform, surface nearly smooth (hairy in *C. m. tuckeri*) with fine incremental and weak spiral striae, 5 to 6 whorls. Shell coloration is translucent to opaque brown. Aperture subtriangular and oblique, parietal tooth white, small and short to well-developed and triangular, lip thickened and recurved, whitish, sometimes with tooth-like thickenings; umbilicus partly or almost wholly covered by the lip; periphery rounded. Animal is dark gray on the head, tentacles, and back, lighter on the sole.

**Internal Anatomy:** Pilsbry 1940.

**Distribution:** East of the Cascade Mountains from southeastern British Columbia and eastern Oregon to western Montana. In Montana, reported west of the Continental Divide from seven counties: Flathead, Lake, Lincoln, Mineral, Missoula, Ravalli, Sanders. Elevation range is 655 to 1920 m (2150 to 6300 ft).

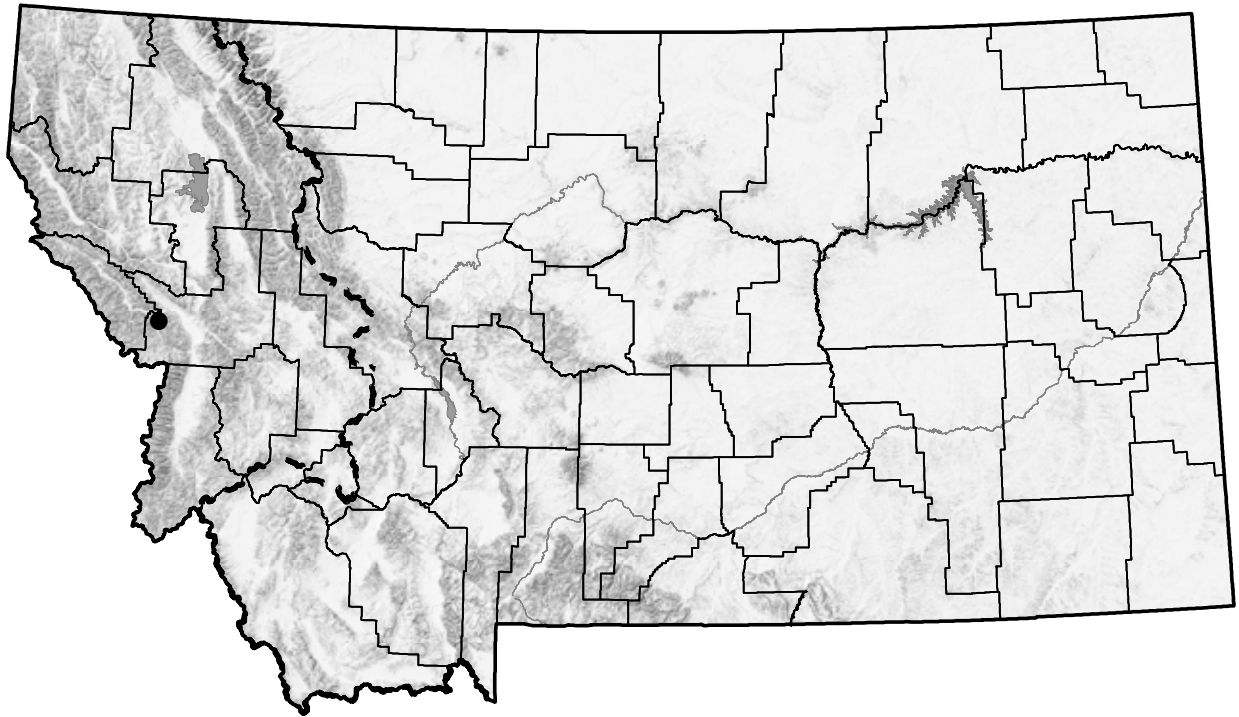
**Habitat:** Forested to semi-open sites, often near moisture. Canopy species include western redcedar, western hemlock, grand fir, Engelmann spruce, subalpine fir, Douglas-fir, western larch, western white pine, lodgepole pine, ponderosa pine, black cottonwood, aspen, and paper birch; secondary canopy includes alder, dogwood, water birch, willow, and mountain maple. Often found under woody debris, rocks, bryophyte mats in talus, leaf litter, and duff.

**Conservation Status:** No special status in Montana (G4 SNR).

**Remarks:** The hairy immature shells of most subspecies eventually lose their hair. Species may be abundant at some localities; 69 were reported from Sanders County in early October.

**Selected References:** Bland and Cooper 1861; Cooper 1868; Forsyth 2004; Frest and Johannes 1995, 1997, 2001; Henderson 1924, 1936; Pilsbry 1940; Vanatta 1914.

***Cryptomastix sanburni* - Kingston Oregonian**



*Photo by Bill Leonard taken from the collection of TE Burke.*



***Cryptomastix sanburni* (Binney, 1886) Kingston Oregonian**

**Synonyms:** *Triodopsis sanburni*, *Polygyra sanburni*.

**Subspecies:** None.

**Description:** A medium sized shell, to 12.2 mm diameter and 7.8 mm in height, flattened heliciform, spire depressed to low-domed, surface nearly smooth with fine incremental striae, first whorl radially striate, about 6 tightly coiled whorls, the last descending in front and contracted behind the lip. Shell coloration is pale, translucent olive brown. Aperture lip thickened and recurved, with three lobes; parietal tooth long and high, palatal tooth squarish and separated by a deep sinus from a bluntly conic basal tooth merging into a callus on the inner margin towards the columella; periphery rounded, umbilicus narrow and partly concealed by the columellar lip.

**Internal Anatomy:** Not described.

**Distribution:** Northern Idaho and northwestern Montana. In Montana, reported west of the Continental Divide from Petty Creek, Missoula County: elevation 1036 m (3400 ft).

**Habitat:** Riparian wooded landscapes; ponderosa pine with a diversity of deciduous shrubs near springs and seeps. Found under woody debris, rocks, and in leaf litter.

**Conservation Status:** Species of Concern in Montana (G1 S1).

**Remarks:** Range, status, and habitat in Montana poorly defined; current status needs investigation. The Montana record consisting of five shells donated to the Field Museum of Natural History (FMNH 158844) by A. Solem is old, needs confirmation and lacks collector, date of collection, and specific coordinates.

**Selected References:** Frest and Johannes 1995, 2001; Henderson 1936; Pilsbry 1940.

*Microphysula ingersolli* - Spruce Snail

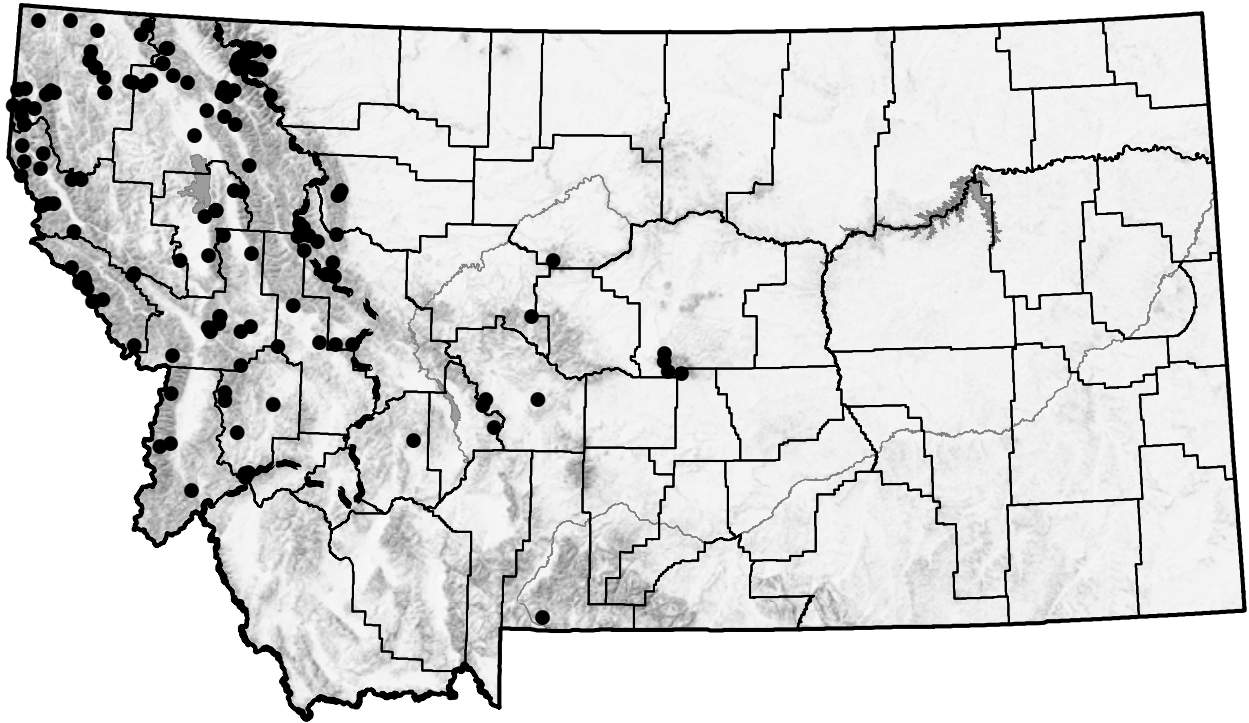


Photo by MTNHP

***Microphysula ingersolli* (Bland, 1874) Spruce Snail**

**Synonyms:** *Thysanophora ingersolli*, *Helix ingersolli*.

**Subspecies:** *H. i. convexior*; validity doubtful.

**Description:** A small shell, to about 5 mm diameter and 2.5 mm in height, flattened-heliciform, to about 5 1/2 tightly-coiled whorls. Shell is translucent, appears smooth (without magnification) and whitish; periphery is rounded. The aperture is crescent-shaped, higher than broad, lip not thickened and lacking teeth; umbilicus is about 1/4 the shell diameter. Head is pale gray, tentacles darker, inner whorls of live shells appear pinkish.

**Internal Anatomy:** Pilsbry 1940.

**Distribution:** British Columbia and Alberta through Washington, eastern Oregon and Nevada, and the Rocky Mountain states to Arizona and New Mexico. In Montana, reported from 19 counties on both sides of the Continental Divide. Elevation range is 655 to 2394 m (2150 to 7855 ft).

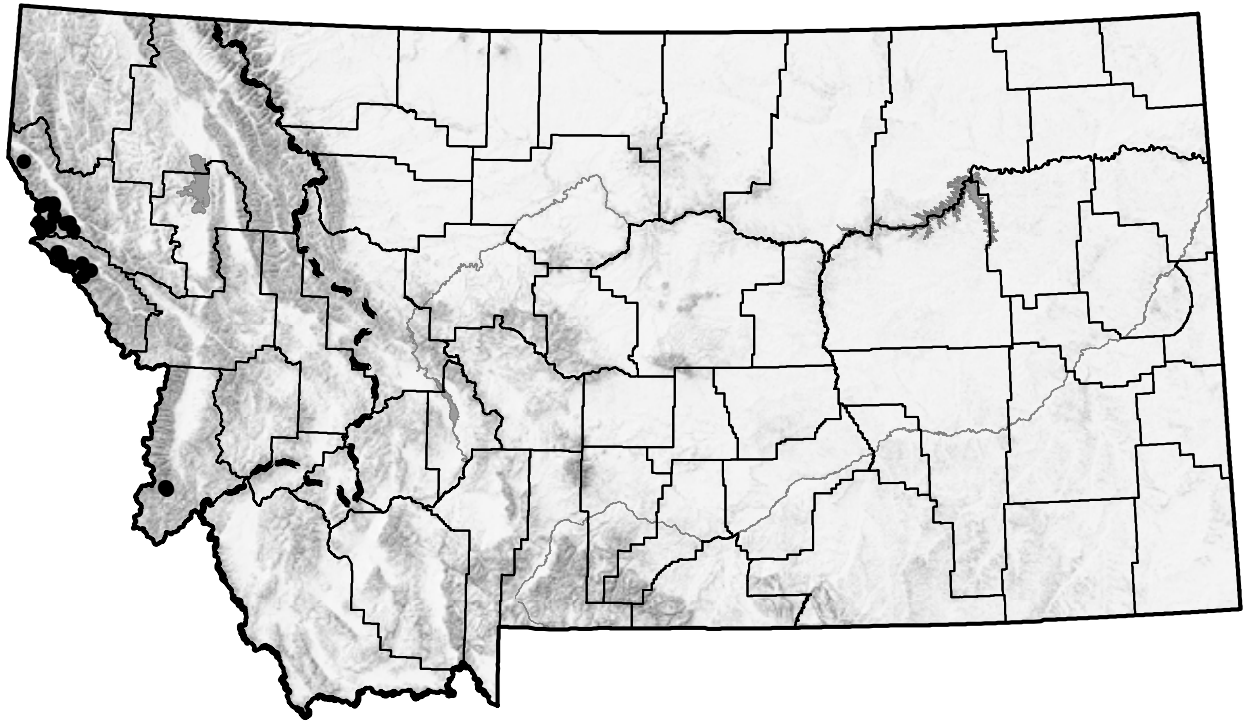
**Habitat:** Occupies both wooded and open sites, to above tree line. Canopy species include Douglas-fir, Engelmann spruce, subalpine fir, western larch, ponderosa pine, whitebark pine, lodgepole pine, black cottonwood, aspen, western redcedar and western hemlock; secondary canopy includes alder, willow, hawthorn, and dogwood. Found under woody debris and rocks (sometimes in rotten wood or talus slopes), in leaf litter or duff; most common in areas with moisture and limestone.

**Conservation Status:** No special status in Montana (G5 SNR).

**Remarks:** One of the few native land snails found above tree line in Montana. May be abundant locally; 63 were reported at one site in Granite County in late July.

**Selected References:** Berry 1916, 1919; Forsyth 2004; Frest and Johannes 2001; Pilsbry 1940; Vanatta 1914.

***Polygyrella polygyrella* - Humped Coin**



*Photo by MTNHP*

***Polygyrella polygyrella* (Bland and Cooper, 1861) Humped Coin**

**Synonyms:** *Helix polygyrella*, *Helicodiscus polygyrella*.

**Subspecies:** Based on a letter from H. B. Baker to R. B. Brunson (24 January 1957), *P. p. montanensis*, which was described from the Deer Lodge Valley, Powell (?) County, Montana by Ancey (1887), is invalid due to inappropriate habitat and the highly dubious location of actual collection.

**Description:** A medium sized shell, to 13 mm diameter and 6 mm in height. The shell is heliciform (discoidal), relatively flattened, greenish or yellowish brown in color, and somewhat translucent and glossy; umbilicus is wide and well-like, about one-third of the diameter, enlarging in the last half whorl. The whorls are closely coiled, about 7 to 8 1/2 in number; the initial 2 to 3 whorls are smooth, the rest with strong radial ribs which become more obscure near the aperture. Aperture is lunate-triangular, with an erect parietal tooth opposite the ends of the lip and triangular in shape, the lip thickened within. Within the last whorl there are one or two radial rows of three teeth each, which are visible as lighter patches through the shell.

**Internal Anatomy:** Pilsbry 1932, 1939.

**Distribution:** Extreme eastern Oregon through northern Idaho and northwestern Montana. In Montana, 23 records from three counties west of the Continental Divide: Mineral (8), Ravalli (3), Sanders (12). Elevation range is 812 to 1526 m (2665 to 5005 ft).

**Habitat:** Occupies mesic mixed conifer forest, often relatively close to water such as streams and seeps; canopy species include western redcedar, western hemlock, grand fir, Engelmann spruce, Douglas-fir, subalpine fir, black cottonwood, and western white pine; secondary canopy includes alder and mountain maple. Found under woody debris and rocks in damp soil and humus.

**Conservation Status:** Montana Species of Concern (G3 S1S2).

**Remarks:** Original description based on individuals collected in 1860 on the east slope of the Coeur d'Alene Mountains, probably Mineral County, Montana, but possibly Shoshone County, Idaho. The Ravalli County populations appear to be isolated. May be locally abundant; 45 and 50 have been found at sites in Ravalli County (at three closely spaced sites) and Sanders County in mid-September and mid-October, respectively.

**Selected References:** Ancey 1887; Bland and Cooper 1861; Cooper 1868; Frest and Johannes 1995, 2001; Henderson 1924, 1936; Hendricks et al. 2006, 2007, 2008; Pilsbry 1932, 1939; Smith 1943.

## GLOSSARY

**Abscission line:** The visible indentation on the tail of some slugs where autotomy occurs.

**Angular tooth:** Outer-most tooth on the parietal surface of the aperture.

**Apertural lip:** The edge of the aperture.

**Aperture:** The opening in a shell through which the animal extends and retracts.

**Apex:** The tip of the shell spire; the part of the shell formed first.

**Autotomy:** The casting off of a body part; in some slugs the voluntary release of the tip of the tail when attacked.

**Axial:** The same direction as the axis of a coiled shell.

**Axis:** The imaginary line around which a shell is coiled.

**Basal:** Of, or at, the base; the lower part of the shell.

**Beehive-shaped:** Dome-shaped shell or shaped like an old-fashion beehive, with height about equal to the width.

**Bryophyte:** Mosses and liverworts.

**Callus:** A thick and usually opaque shell deposit, usually inside the apertural lip.

**Carinate:** Having a distinct protruding ridge on the periphery of the shell; a keeled shell.

**Chitinous:** Having a hard, horny surface layer or outer integument.

**Columella:** The central pillar formed by the inner walls of the whorls through which the axis passes.

**Columellar:** Pertaining to the columella; columellar and subcolumellar teeth are found on this surface.

**Columellar baffle:** A more-or-less vertical tooth-like projection hidden behind the columella in some species of Pupillidae.

**Crest:** A raised axial ridge on the last whorl behind, and parallel with, the apertural lip, often set off from the lip by a constriction.

**Cuticle:** Hardened and thin outer chitinous layer.

**Denticle:** A small tooth-like projection within the aperture, on the apertural lip, or behind the lip within the shell; also called tooth, lamella, lamina.

**Depressed:** Pertaining to a low spire.



**Dextral:** Whorls spiral to the right from the apex.

**Disjunct:** Disconnected or separate distribution or range; isolated.

**Distal:** Located farther away from the center of a body or appendage.

**Dorsal:** Pertaining to the back, top, or upper surface.

**Endemic:** Confined or indigenous to a certain region.

**Exotic:** Introduced from a foreign region; non-native.

**Flared:** To open or spread outward; usually pertaining to the apertural lip.

**Foot:** The muscular organ of locomotion; includes the tail.

**Genus:** The first word of a binomial scientific name; also the primary category between family and species in scientific classification.

**Glossy:** Shiny, smooth.

**Granulose:** Grainy, covered with small bumps.

**Hair:** Small hair-like projections on the thin chitinous covering or periostracum of many shells.

**Height:** The maximum measurement taken along the line of axis from the shell apex to the base or basal lip; length.

**Heliciform:** The typical form of a coiled land snail shell, with the height less than or equal to the width.

**Impressed:** Indented.

**Introduced:** Exotic or non-native.

**Keel:** The longitudinal mid-dorsal ridge on the tail of some slugs; the protruding ridge or carination on the periphery of some snail shells.

**Lamella:** A thin, plate-like element.

**Lamellar:** Thin and flat, like a lamella.

**Lip:** The edge of the shell opening or aperture; apertural lip.

**Lirae:** Raised spiral ridges on the surface of a shell, similar to the carina or keel, but not at the periphery.

**Lymnaeiform:** Shells where height exceeds width and the aperture is greater than half the shell height.

**Mantle:** A fold of the body wall that lines and secretes the shell in shell-bearing molluscs; a dorsal and exposed oval patch or flap behind the head on slugs.

**Mantle cleft:** A slit on the right side of the mantle of slugs that terminates at the pneumostome or breathing pore.

**Mantle notch:** A small notch visible on the right posterior margin of the mantle of some slugs, such as *Zacoleus* and *Udosarx*.

**Mantle slit:** A mid-dorsal longitudinal opening in the mantle of *Hemphillia* slugs through which the internal shell is exposed and visible.

**Median groove:** A groove along the dorsal midline on the foot of some slugs, such as *Hemphillia*.

**Mesic:** Pertaining to habit with moderate or well-balanced moisture requirements.

**Mucous:** A viscid slippery secretion of the skin that aids locomotion, water retention, and defense; it may be clear or colored.

**Mucous pore:** Opening at the tip of the tail or foot on some slugs.

**Native:** Born or evolved in a particular region; indigenous.

**Neck:** Region between the head and mantle.

**Ovate:** Egg-shaped.

**Palatal:** Pertaining to the region within the aperture on the outer margin of the final whorl, and upon which the thick opaque palatal callus and palatal denticles or teeth may be present.

**Papillae:** Small dermal projections similar in form to nipples.

**Parietal:** The part of the wall of a coiled shell formed by the shell wall of the preceding whorl; supports the parietal, infraparietal and angular teeth in the aperture.

**Periostracum:** A thin chitinous covering on the exterior of many shells, often with hairs or wrinkles.

**Pneumostome:** A hole on the right side of the mantle through which an animal breathes; breathing pore.

**Proximal:** Located nearer the center of the body or appendage.

**Pupiform:** Shells where height exceeds width, but the aperture is less than half the shell height; shaped like an insect pupa.

**Recurved:** Curved or bent back, as at the apertural lip; reflected.

**Reflected:** Curved or bent back, as at the apertural lip; recurved.

**Reticulate:** A net-like pattern of marks or indentations.

**Rib:** A long, narrow ridge-like element of shell surface ornamentation; sometimes called a costa.

**Riblet:** A small rib.

**Riparian:** The interface or zone along a stream or river; vegetative zone influenced by the presence of adjacent water.

**Shoulder:** That part of the whorl directly below the suture and above the periphery, either angular or rounded.

**Sinistral:** Whorls spiral to the left from the apex.

**Sinulus:** An indentation of the apertural lip in some species of Vertiginidae and Pupillidae; sometimes called the auricle.

**Sole:** The base of bottom of the foot.

**Species:** The second word of a scientific binomial name; the next lower primary category after Genus in scientific classification.

**Spiral:** In the direction of the coiling of the shell.

**Spire:** All whorls of a coiled shell except the last.

**Striae** Narrow incised lines on the shell surface.

**Striate:** Having striae.

**Subcylindrical:** Approximately cylindrical.

**Subovate:** Approximately ovate or egg-shaped.

**Succineiform:** A type of Lymnaeiform with a very small spire relative to the aperture, especially evident in *Oxyloma* and *Succinea*.

**Suture:** The continuous seam between two adjacent whorls of a coiled shell.

**Tail:** The portion of the foot of a slug extending posterior or behind the mantle.

**Tail pore:** Mucous pore.

**Tooth:** Denticle.

**Tentacles:** Two pairs of sensory organs on the head of snails and slugs, slender and either contractile or retractile.

**Thread:** A narrow raised and usually spiral sculptural element on a shell.

**Tripartite sole:** A sole divided into three longitudinal sections separated by two grooves.

**Tubercle:** A swelling, hump, or knob.

**Umbilicus:** The pit, indentation or depression visible on the base of some coiled shells, formed when the inner surfaces of whorls do not join.

**Undivided sole:** Lacking the two longitudinal grooves that divide the sole into three parts.

**Visceral hump:** The exceptionally elevated and hump-like mantle of *Hemphillia*.

**Whorl:** A full coil of the tube of a snail shell; the final full coil leading to the aperture is the body whorl.

**Width:** The maximum measurement taken perpendicular to the shell axis; breadth or diameter.

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## **APPENDIX A. GLOBAL / STATE RANK DEFINITIONS**





## HERITAGE PROGRAM RANKS

The international network of Natural Heritage Programs employs a standardized ranking system to denote global (range-wide) and state status. Species are assigned numeric ranks ranging from 1 to 5, reflecting the relative degree to which they are “at-risk”. Rank definitions are given below. A number of factors are considered in assigning ranks — the number, size and distribution of known “occurrences” or populations, population trends (if known), habitat sensitivity, and threat. Factors in a species’ life history that make it especially vulnerable are also considered (e.g., dependence on a specific pollinator).

### GLOBAL RANK DEFINITIONS (NatureServe 2003)

- G1 Critically imperiled because of extreme rarity and/or other factors making it highly vulnerable to extinction
- G2 Imperiled because of rarity and/or other factors making it vulnerable to extinction
- G3 Vulnerable because of rarity or restricted range and/or other factors, even though it may be abundant at some of its locations
- G4 Apparently secure, though it may be quite rare in parts of its range, especially at the periphery
- G5 Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery
- T1-5 **Intraspecific Taxon** (trinomial) —The status of infraspecific taxa (subspecies or varieties) are indicated by a “T-rank” following the species’ global rank

### STATE RANK DEFINITIONS

- S1 At high risk because of extremely limited and potentially declining numbers, extent and/or habitat, making it highly vulnerable to extirpation in the state
- S2 At risk because of very limited and potentially declining numbers, extent and/or habitat, making it vulnerable to extirpation in the state
- S3 Potentially at risk because of limited and potentially declining numbers, extent and/or habitat, even though it may be abundant in some areas
- S4 Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern
- S5 Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range

### COMBINATION RANKS

G#G# or S#S# **Range Rank**—A numeric range rank (e.g., G2G3) used to indicate uncertainty about the exact status of a taxon

### QUALIFIERS

- NR Not ranked
- Q **Questionable taxonomy that may reduce conservation priority**—Distinctiveness of this entity as a taxon at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority (numerically higher) conservation status rank

X	<b>Presumed Extinct</b> —Species believed to be extinct throughout its range. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered
H	<b>Possibly Extinct</b> —Species known from only historical occurrences, but may never-the-less still be extant; further searching needed
U	<b>Unrankable</b> —Species currently unrankable due to lack of information or due to substantially conflicting information about status or trends
HYB	<b>Hybrid</b> —Entity not ranked because it represents an interspecific hybrid and not a species
?	<b>Inexact Numeric Rank</b> —Denotes inexact numeric rank
C	<b>Captive or Cultivated Only</b> —Species at present is extant only in captivity or cultivation, or as a reintroduced population not yet established
A	<b>Accidental</b> —Species is accidental or casual in Montana, in other words, infrequent and outside usual range. Includes species (usually birds or butterflies) recorded once or only a few times at a location. A few of these species may have bred on the one or two occasions they were recorded
Z	<b>Zero Occurrences</b> —Species is present but lacking practical conservation concern in Montana because there are no definable occurrences, although the taxon is native and appears regularly in Montana
P	<b>Potential</b> —Potential that species occurs in Montana but no extant or historic occurrences are accepted
R	<b>Reported</b> —Species reported in Montana but without a basis for either accepting or rejecting the report, or the report not yet reviewed locally. Some of these are very recent discoveries for which the program has not yet received first-hand information; others are old, obscure reports
SYN	<b>Synonym</b> —Species reported as occurring in Montana, but the Montana Natural Heritage Program does not recognize the taxon; therefore the species is not assigned a rank
*	A rank has been assigned and is under review. Contact the Montana Natural Heritage Program for assigned rank
B	<b>Breeding</b> —Rank refers to the breeding population of the species in Montana
N	<b>Nonbreeding</b> —Rank refers to the non-breeding population of the species in Montana

**APPENDIX B. MONTANA LAND MOLLUSKS  
AND THEIR HABITAT ASSOCIATIONS**



Appendix B. Montana land mollusks and their habitat associations. Bolded species are state Species of Concern (see individual accounts for details).

Mollusk Species	Moist mixed-conifer forest			Aspen, broadleaf riparian	Dry mixed-conifer forest			Limestone talus	Wetland	Urban, disturbed
	cedar-hemlock, grand fir, Douglas-fir	spruce-fir	talus, rocky ground		ponderosa pine, Douglas-fir, western larch	juniper, sagebrush, grassy	talus, rocky ground			
Slugs										
<i>Arion circumscriptus</i>	x			x					x	x
<i>Arion fasciatus</i>				x	x				x	x
<i>Arion intermedius</i>	x			x					x	x
<i>Arion rufus</i>	x			x						x
<i>Arion subfuscus</i>	x			x	x				x	x
<i>Derocerus laevis</i>	x		x	x	x		x		x	x
<i>Derocerus reticulatum</i>				x	x				x	x
<b><i>Hemphillia camelus</i></b>	x		x	x						
<b><i>Hemphillia danieli</i></b>	x	x	x	x						
<b><i>Kootenaia burkei</i></b>	x	x		x						
<i>Limax maximus</i>	x			x						x
<b><i>Magnipelta mycophaga</i></b>	x	x	x	x						
<b><i>Prophysaon andersoni</i></b>	x	x		x						
<b><i>Prophysaon humile</i></b>	x	x	x	x						
<b><i>Udosarx lyrata</i></b>	x	x	x	x						
<b><i>Zacoleus idahoensis</i></b>	x	x	x	x						
Snails										
<i>Allogona ptychophora</i>	x			x	x					
<i>Anguispira kochi</i>	x			x						
<i>Catinella rehderi</i>				x					x	
<i>Catinella vermeta</i>				x	x				x	
<i>Cochlicopa lubrica</i>				x	x					x
<i>Columella columella</i>		x		x	x					
<i>Columella edentula</i>	x	x		x						
<i>Cryptomastix mullani</i>	x	x	x	x	x					
<b><i>Cryptomastix sanburni</i></b>				x	x					
<b><i>Discus brunsoni</i></b>										
<b><i>Discus shimekii</i></b>		x		x	x					
<i>Discus whitneyi</i>	x	x	x	x	x					
<i>Euconulus fulvus</i>	x	x	x	x	x					
<i>Gastrocopta armifera</i>					x		x	x		
<i>Gastrocopta holzingeri</i>				x	x					

Mollusk Species	Moist mixed-conifer forest			Aspen, broadleaf riparian	Dry mixed-conifer forest			Limestone talus	Wetland	Urban, disturbed
	cedar-hemlock, grand fir, Douglas-fir	spruce-fir	talus, rocky ground		ponderosa pine, Douglas-fir, western larch	juniper, sagebrush, grassy	talus, rocky ground			
Snails										
<i>Gastrocopta pentodon</i>				X	X					
<b><i>Haplotrema vancouverense</i></b>	X			X						
<i>Hawaiiia minuscula</i>					X	X	X	X		
<i>Microphysula ingersolli</i>	X	X	X	X	X	X	X	X		
<i>Nesovitrea binneyana</i>	X	X		X	X					
<i>Nesovitrea electrina</i>		X		X	X					
<b><i>Oreohelix alpina</i></b>		X						X		
<b><i>Oreohelix amariradix</i></b>					X		X			
<b><i>Oreohelix carinifera</i></b>					X	X		X		
<b><i>Oreohelix elrodi</i></b>	X		X		X			X		
<b><i>Oreohelix haydeni</i></b>					X			X		
<b><i>Oreohelix pygmaea</i></b>					X	X		X		
<b><i>Oreohelix strigosa</i></b>	X	X	X	X	X	X	X	X		
<i>Oreohelix subrudis</i>	X	X	X	X	X		X	X		
<b><i>Oreohelix yavapai</i></b>					X	X		X		
<i>Oxychilus alliiarius</i>				X						X
<i>Oxychilus draparnaudi</i>				X						X
<i>Oxyloma gouldi</i>				X					X	
<i>Oxyloma haydeni</i>				X					X	
<i>Oxyloma missoula</i>				X					X	
<i>Oxyloma nuttallianum</i>				X					X	
<i>Paralaoma caputspinulae</i>				X	X					X
<b><i>Polygyrella polygyrella</i></b>	X	X	X	X						
<b><i>Pristiloma wascoense</i></b>		X	X							
<i>Punctum californicum</i>	X	X	X	X	X					
<i>Punctum minutissimum</i>				X	X					
<i>Pupilla blandi</i>				X						
<i>Pupilla hebes</i>				X				X		
<i>Pupilla muscorum</i>				X				X		
<i>Pupilla syngenes</i>				X	X	X	X	X		
<i>Radiodiscus abietum</i>	X	X	X	X	X					
<i>Striatura pugetensis</i>	X			X						



Mollusk Species	Moist mixed-conifer forest			Aspen, broadleaf riparian	Dry mixed-conifer forest			Limestone talus	Wetland	Urban, disturbed
	cedar-hemlock, grand fir, Douglas-fir	spruce-fir	talus, rocky ground		ponderosa pine, Douglas-fir, western larch	juniper, sagebrush, grassy	talus, rocky ground			
Snails										
<i>Succinea grosvenori</i>				x			x		x	
<i>Vallonia cyclophorella</i>				x		x	x	x		
<i>Vallonia gracilicosta</i>	x	x	x	x		x				
<i>Vallonia perspectiva</i>				x			x	x		
<i>Vallonia pulchella</i>				x		x				x
<b><i>Vertigo binneyana</i></b>		x		x		x		x		
<i>Vertigo concinnula</i>				x						
<i>Vertigo elatior</i>				x						
<i>Vertigo gouldi</i>				x		x				
<i>Vertigo modesta</i>	x	x	x	x		x				
<i>Vertigo ovata</i>		x		x					x	
<i>Vitrina pellucida</i>	x	x		x		x				
<i>Zoogenetes harpa</i>		x		x		x				
<i>Zonitoides arboreus</i>	x	x		x		x	x			
<i>Zonitoides nitidus</i>				x		x			x	



## **APPENDIX C. MOLLUSK SURVEY FIELD FORM**

[http://mtnhp.org/docs/mollusks\\_obs.pdf](http://mtnhp.org/docs/mollusks_obs.pdf)



## Data Form for Terrestrial Mollusk Site Surveys

### Locality Information

Forest:	District (Mtn Range):	Site No:	Locality:				
State:	County:	Map Name:	T	R	S	Section Description:	
Owner:	Map Elevation:	FT	Datum:	UTM Zone:	UTM East:	UTM North:	

### Habitat Information

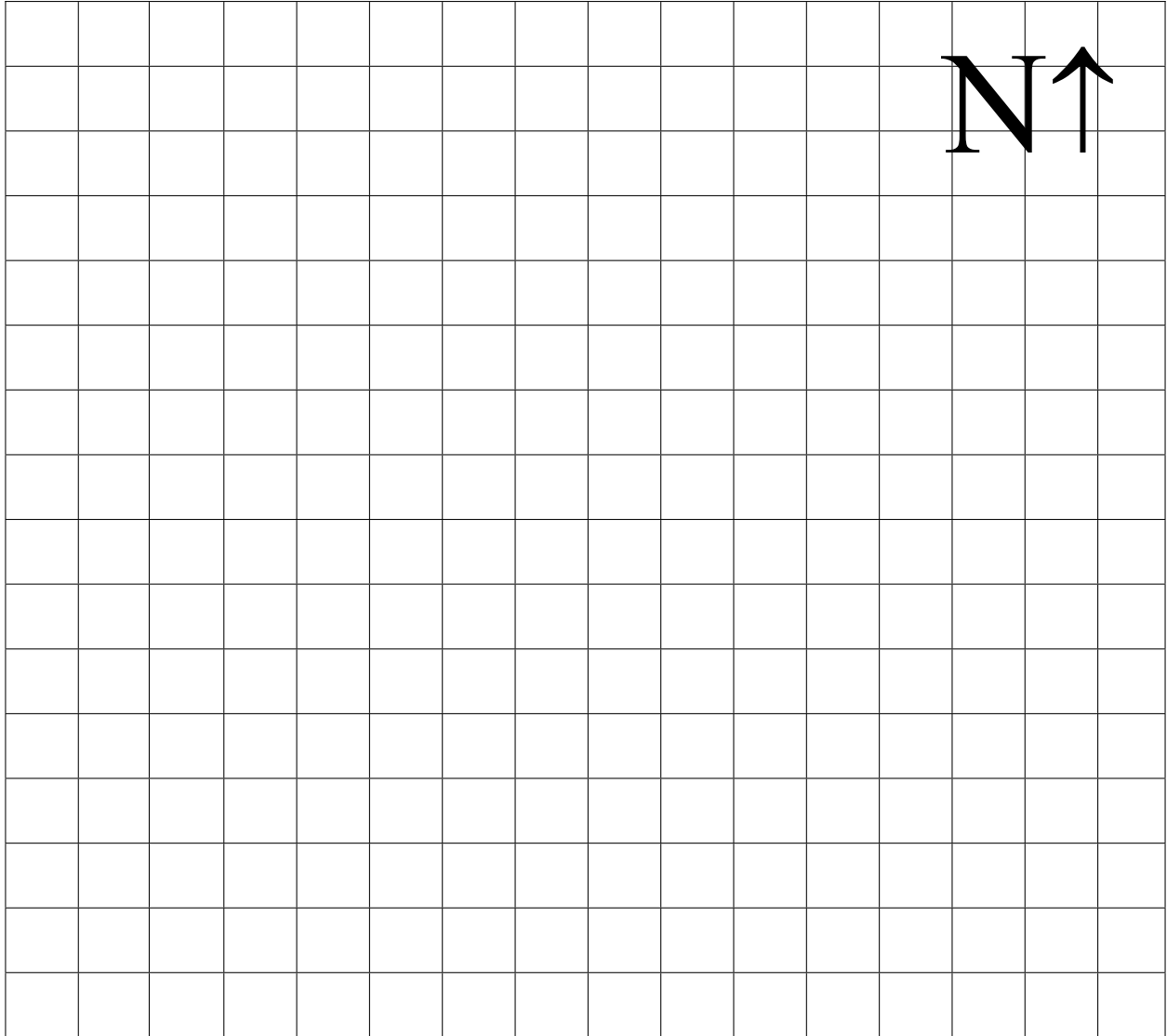
Date:	Observer(s)	Begin Time:	End Time:	Total Person Minutes of Search:	Area (M <sup>2</sup> ) Searched:		
Percentage of Site Searched: 1-25 26-50 51-75 76-100		Percent Slope:	Aspect: N NE NW S SE SW E W				
Habitat Type: Spring/Seep Streamside Talus Deciduous Forest Conifer Forest Mixed Forest Shrub/Steppe Grassland Other							
Primary Canopy Species:					Overall Percent Canopy Cover: 0 1-25 26-50 51-75 76-100		
					Canopy Species Average DBH (cm): 0-5 5-15 15-30 30-60 >60		
Photo Frame Number(s) / Description(s):							
Weather:	Clear	Partly Cloudy	Overcast	Rain	Snow	Air Temp: °C	Soil Temp: °C
Soil Moisture: Dry Damp Wet Standing Water Snow			Rock Type: Igneous Metamorphic Sedimentary				
			Note Specific Type (e.g. limestone, granite):				
Habitat Threats:							

### Mollusk Species Information

Species:	Number Alive and/or Dead, Size, and Time at First Detection (e.g., 2 alive & 4 dead x 15mm Diameter or TL @ 10 minutes)					
Tissue Number (e.g., H001A)	Substrate Association (Circle): under wood    under 4-20cm rock fragments    under >20cm rock fragments on or under bryophyte mat    under leaf litter    in rock fracture    Other _____					
Voucher Number & Description:						
Species:	Number Alive and/or Dead, Size, and Time at First Detection (e.g., 2 alive & 4 dead x 15mm Diameter or TL @ 10 minutes)					
Tissue Number (e.g., H001A)	Substrate Association (Circle): under wood    under 4-20cm rock fragments    under >20cm rock fragments on or under bryophyte mat    under leaf litter    in rock fracture    Other _____					
Voucher Number & Description:						
Species:	Number Alive and/or Dead, Size, and Time at First Detection (e.g., 2 alive & 4 dead x 15mm Diameter or TL @ 10 minutes)					
Tissue Number (e.g., LC001A)	Substrate Association (Circle): under wood    under 4-20cm rock fragments    under >20cm rock fragments on or under bryophyte mat    under leaf litter    in rock fracture    Other _____					
Voucher Number & Description:						
Species:	Number Alive and/or Dead, Size, and Time at First Detection (e.g., 2 alive & 4 dead x 15mm Diameter or TL @ 10 minutes)					
Tissue Number (e.g., G001A)	Substrate Association (Circle): under wood    under 4-20cm rock fragments    under >20cm rock fragments on or under bryophyte mat    under leaf litter    in rock fracture    Other _____					
Voucher Number & Description:						

## Site Map for Terrestrial Mollusk Site Surveys

Grid Scale:



\* Draw a rough sketch of the site labeling major features such as streams, talus slopes, habitat cover types, etc. Be sure to indicate where animals were detected and label the following locations on the map: **G** = GPS reading, and **P→** = photo locations and directions of photos.

**Other Notes:**

Site ID (Forest, Ranger District, Site Number) \_\_\_\_\_ Date: \_\_\_\_\_

**Mollusk Species Information Continued**

Species:	Number Alive and/or Dead, Size, and Time at First Detection (e.g., 2 alive & 4 dead x 15mm Diameter or TL @ 10 minutes)		
Tissue Number (e.g., H001A)	Substrate Association (Circle):		
Voucher Number & Description:	under wood	under 4-20cm rock fragments	under >20cm rock fragments
	on or under bryophyte mat	under leaf litter	in rock fracture Other _____
Species:	Number Alive and/or Dead, Size, and Time at First Detection (e.g., 2 alive & 4 dead x 15mm Diameter or TL @ 10 minutes)		
Tissue Number (e.g., H001A)	Substrate Association (Circle):		
Voucher Number & Description:	under wood	under 4-20cm rock fragments	under >20cm rock fragments
	on or under bryophyte mat	under leaf litter	in rock fracture Other _____
Species:	Number Alive and/or Dead, Size, and Time at First Detection (e.g., 2 alive & 4 dead x 15mm Diameter or TL @ 10 minutes)		
Tissue Number (e.g., LC001A)	Substrate Association (Circle):		
Voucher Number & Description:	under wood	under 4-20cm rock fragments	under >20cm rock fragments
	on or under bryophyte mat	under leaf litter	in rock fracture Other _____
Species:	Number Alive and/or Dead, Size, and Time at First Detection (e.g., 2 alive & 4 dead x 15mm Diameter or TL @ 10 minutes)		
Tissue Number (e.g., G001A)	Substrate Association (Circle):		
Voucher Number & Description:	under wood	under 4-20cm rock fragments	under >20cm rock fragments
	on or under bryophyte mat	under leaf litter	in rock fracture Other _____
Species:	Number Alive and/or Dead, Size, and Time at First Detection (e.g., 2 alive & 4 dead x 15mm Diameter or TL @ 10 minutes)		
Tissue Number (e.g., G001A)	Substrate Association (Circle):		
Voucher Number & Description:	under wood	under 4-20cm rock fragments	under >20cm rock fragments
	on or under bryophyte mat	under leaf litter	in rock fracture Other _____
Species:	Number Alive and/or Dead, Size, and Time at First Detection (e.g., 2 alive & 4 dead x 15mm Diameter or TL @ 10 minutes)		
Tissue Number (e.g., G001A)	Substrate Association (Circle):		
Voucher Number & Description:	under wood	under 4-20cm rock fragments	under >20cm rock fragments
	on or under bryophyte mat	under leaf litter	in rock fracture Other _____

**Other Notes:**



### **Site Information**

**Ecoregion:** One of the 14 ecoregion sections in Montana or 6 in the Idaho Panhandle.

**Sample Block:** Identify three digit number of the sampling block (range 001-999).

**Site No:** Identify three digit number of the site being surveyed within each sampling block (range 001-999).

**Locality:** Describe the specific geographic location of the site so that the type of site is described and the straight-line air distance from one or more permanent features on a 7.5-minute (1:24,000 scale) topographic map records the position of the site (e.g., Large talus slope 1.5 miles north of Engle Peak, N side of FS Road 225).

**State:** Use the two-letter abbreviation.

**County:** Use the full county name.

**Map Name:** List the name of the USGS 7.5-minute (1:24,000 scale) topographic quadrangle map.

**T:** Record the Township number and whether it is north or south.

**R:** Record the Range number and whether it is east or west.

**S:** Record the Section number

**Section Description:** Describe location of the site at the ¼ of ¼ section level (e.g., SENE indicates SE corner of NE corner).

**Owner:** Use abbreviation of the government agency responsible for managing the land you surveyed. (e.g. USFS, BLM). If private land was surveyed list the owner's full name to indicate that you did not trespass.

**Map Elevation:** The elevation of the site as indicated by the topographic map in feet (avoid using elevations from a GPS)

**Datum:** The map datum used (typically NAD 27 if off topographic map or WGS84 if off GPS unit on standard setting).

**UTM Zone:** Universal Transverse Mercator zone recorded on the topographic map.

**UTM East:** Universal Transverse Mercator easting coordinate in meters as recorded on the topographic map or GPS receiver.

Be sure to note any major differences between UTM coordinates on the map and those on the GPS receiver.

**UTM North:** Universal Transverse Mercator northing coordinate in meters as recorded on the topographic map or GPS receiver. Be sure to note any major differences between UTM coordinates on the map and those on the GPS receiver.

### **Survey Information**

**Date:** Use MM-DD-YY format (e.g. 05/12/00 for May 12 of 2000).

**Observers:** List names or initials of individuals involved with survey of this site and circle the name of the recorder.

**Begin Time:** List the time the survey began in 24-hour format.

**End Time:** List the time the survey ended in 24-hour format.

**Total Person Minutes of Search:** Record the total person minutes the site was searched (e.g. if one person surveys for 15 minutes and another surveys for 30 minutes, but takes 5 minutes to measure a specimen the total person minutes is 40 minutes).

**Area (M<sup>2</sup>) Searched:** Area in square meters that was surveyed.

**Percent of Site Searched:** Circle the appropriate category.

**Percent Slope:** Percent slope of site. Enter range if variable.

**Aspect:** Circle primary aspect of the site.

**Habitat Type:** Circle the appropriate habitat type.

**Primary Canopy Species:** List the major plant species in the canopy (e.g., red cedar, western hemlock, grand fir, ninebark)

**Overall Percent Canopy Cover:** Circle the appropriate category for total canopy cover.

**Canopy Species Average DBH:** Circle the appropriate category.

**Photo Frame Number(s) / Descriptions:** The number of the photo as viewed on the camera's view screen and a description of the contents of the photograph (e.g., #13 = 1 x *Oreohelix strigosa* and #14-18 = 5 x habitat). Take photos of all portions of the site and anything else that may be of interest (e.g., millipedes, potential site threats).

**Weather:** Circle weather condition during survey.

**Air Temp:** Record air temperature in °C at chest height in the shade. °C = (°F – 32)/1.8

**Soil Temp:** Record soil temperature in °C at 10 cm depth. °C = (°F – 32)/1.8

**Soil Moisture:** Circle the appropriate category.

**Rock Type:** Circle the appropriate category; note specific type if known.

**Habitat Threats:** Note impacts from grazing, logging, mining, flooding, road building, weeds, fire, etc.

### **Species Information**

For each species, record the genus name and species, if known. If species cannot be identified in the field, place a brief description of their morphology here. Record the number alive and dead, and size range for individuals encountered, and time at first detection for the first individual encountered (e.g., 2 x 15 mm diameter (shells) or TL = 80-90mm (slugs): @ 10 minutes). Record the tissue number or range of tissue numbers for tissue samples collected (see tissue collection protocols). Record the preliminary museum voucher specimen number and description for voucher specimens collected (see voucher specimen collection protocols). Circle the substrate the animal was associated with at time of detection. Record the presence of other species detected at the site (e.g., millipedes), the time at first detection, and the voucher number and description of animals collected (see voucher and tissue collection protocols).